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Industrial Editor: J. H. COSENS *Technical Consultant:* C. O. BRETTELLE, M.I.E.E.

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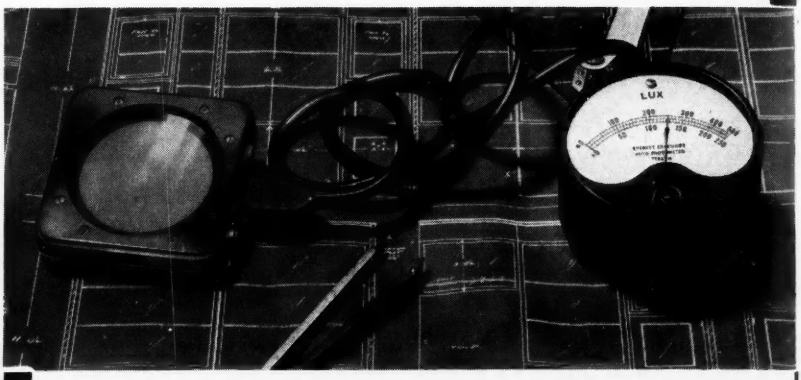

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ELECTRICAL
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Vol. CXLVII No. 3809 24TH NOVEMBER, 1950
THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872

Pumped Water Power

A SCOTTISH OPPORTUNITY MISSED ?

THE regrettable difference of opinion that has occurred about amounts and times of the supply of power by the North of Scotland Hydro-Electric Board (Loch Sloy plant) to the British Electricity Authority prompts the question, among others, of how water power can best be used.

The ideal way of operating, when the opportunity occurs, is so to regulate the flow of water to the turbines that the generators are enabled to work at 100 per cent load factor throughout the year.

Continuous operation will draw a constant quantity of water from the reservoirs. The aqueducts, whether they be flumes, tunnels or pipes, consequently do not need to be of larger cross-section than necessary to convey the unvarying volume of water involved and the cost of the power house, its foundations, tail race, superstructure and the plant it contains will likewise be minimized.

Increased Cost

In contrast to such a least-cost scheme the reduction of load factor, for example, to 50 per cent would mean that the hydraulic and machinery capacity must be doubled since twice the average would be required for half the time in any period. The resulting greater capital cost would materially affect the cost per kWh generated.

Complete regulation of the flow of water is however a rarity and very expensive, but so is the construction of modern steam power stations—now approaching £55/kW of plant installed in this country whereas in other countries the cost of harnessing water power is as low as £43/kW, so tending to make the latter competitive.

Partial Storage

Nevertheless the cost of building massive dams to form artificial reservoirs is so great that designers have usually to be satisfied with partial storage for regulation in order that their propositions shall be economic; the output of power is then variable. Stand-by steam power plant is sometimes provided as a safeguard against deficiency of water, but in appropriate circumstances and suitable localities pumped water storage can be advantageous because it does not involve any stand-by expenses and makes supplementary power available at short notice.

The electrical pumping of auxiliary water into storage at times of light load for use in the reverse direction when needed later on by the main generating plant, could, it has been estimated, have endowed the Loch Sloy project with a peak capacity amounting to nearly twice the ultimate 130,000 kW (four sets, two installed) which is contemplated at present.

The site of this single-station project is the only one which is ripe for the development of pumped storage in the British Isles. The power is there with Loch Sloy not too far away from, or too high above, the tail race into Loch Lomond—in a locality with a rainfall of 120 in yearly, one inch of which is there capable of yielding a million kWh. But instead of providing a means of easing the national peak and of furnishing operating data that are needed, the annual Scottish water power output will be simply augmented by a little less than could be generated by 30,000 kW of steam plant operated on the normal load curve.

POWER FOR REARMAMENT

Although it is quite certain that existing power plant in this country is inadequate to meet the extra demands which rearmament will impose, there seems some doubt about the position in the United States. The Secretary of the Interior (Mr. Oscar L. Chapman) has told the Electric Utility Defense Advisory Council that the planned expansion of plant would be insufficient to meet prospective demands. He called for the consideration of ways and means of accomplishing further expansion. Mr. Chapman's views are contested by the Edison Electric Institute which, after a national survey, maintains that there is plenty of power to meet the country's needs. In December there will be an excess of 11·7 per cent of plant over the peak demand.

CUTS AND FAULTS

A letter published in this issue from Mr. G. O. Watson calls attention to a general possibility of consumers remaining supine when faults occur in the supply system, assuming that these are just the inevitable "power cuts." It also shows the need for warning consumers of the likelihood of their being deprived of power at certain times. Where a rota system of load shedding is adopted this can be done either by notices to consumers (a method employed, for instance, by the South Wales Electricity Board) or by announcements in the local newspapers, which is the way adopted by the South Western Board. Then if the supply goes off when it is not supposed to the consumer can investigate the cause.

COLLIERY ELECTRIFICATION

In its gigantic "Plan for Coal" the National Coal Board backs the dictum of the Reid Committee that modernization means electrification. The report indicates the interdependence of the Coal Board and the British Electricity Authority. As a customer the B.E.A. is expected to require as much as 60 million tons by 1975 (about twice the present-day figure) and the Coal Board hopes to dispose of much of its low-grade product to the B.E.A. In the other direction, the Coal Board will require an annual supply of between 7,500 and 10,000 million kWh. The bulk of this will be supplied from the national grid; the rest will be produced by pit-head power stations, presumably to be erected by the Coal Board itself. It is evident that the Plan presages a good deal of work for the electrical industry both in the supply of generating plant and the equipment for the winning and handling of coal.

PIT-HEAD GENERATION

The mention of this subject in the "Plan for Coal" has been followed by a reference to coalfield generation by the chairman of the B.E.A. at an I.E.E. Centre dinner at Liverpool last week. The two terms do not necessarily mean the same thing, but Lord Citrine confirmed the anticipation that a number of power stations will have to be built on sites, which will need to be very carefully selected, adjacent to the coalfield in mid-England. We mentioned this probability nine months ago when commenting on the 275/300 kV super-grid development, indicating that extra-high voltage must be employed for conveying energy generated near collieries to distant centres. It now appears that 380 kV has been decided upon for this bulk transmission purpose.

TIDAL POWER

At the same function Lord Citrine reawakened interest in tidal power. In a general survey of future requirements he is reported to have envisaged the possibility that it may, in time, become necessary to proceed with the tidal barrage scheme (800 MW) in the River Severn estuary. If this project is reformulated it will not be for economic reasons, but because considerations of a quite different character are beginning to tip the balance. The fact that the present yearly consumption of thirty million tons of coal in B.E.A. stations is expected to be nearly doubled in the next twenty years, makes it evident that the urge to save coal will be a pressing one before long.

D.C. Generator Amplifier

Use in Servo Control Systems

By JOHN C. WEST, B.SC., A.M.I.E.E.*

DURING the last ten years the theory and practice of control mechanisms have been advanced greatly. It is now possible to control automatically, to fine limits, such things as the position or speed of large masses, the voltage, current or frequency of a generator and many more things. They all however possess one dominating feature in that the better the control system in the sense of performance within closer limits and tolerated errors, the more complicated the system becomes with extra control apparatus such as electronic amplifiers, amplidynes, metadynes, etc., adding to the initial expense and to maintenance. In cases in which the control requirements are not too strict it is often possible to use very simple systems employing standard equipment, but this aspect of control engineering does not as yet seem to have been fully exploited.

All control systems depend for their success on a power amplifying element which physically can be of many forms. This description of the use of a d.c. shunt generator as an amplifier shows not only its limitations, but also its successful operation in a simple control system. The principle of the amplifier will be dealt with first.

The Amplifier

The voltage at which a shunt generator operates is governed by the magnetization characteristic and by the resistance of the shunt field winding. In the steady state the terminal voltage is such that the current it produces in the shunt winding is just the correct value for the exciting ampere-turns to generate the voltage. If the resistance of the field winding is very small the field current will be large and the magnetic circuit saturated, so that the output is governed by the strength of the saturation field. If the resistance is too large, not enough current will flow through the field and the machine cannot excite. If, however, the resistance is of the same order as the critical resistance the voltage can vary enormously with small changes in the resistance.

On an approximate straight line characteristic graph (Fig. 1) of the generated voltage in terms of the excitation field OR represents the voltage due to residual magnetism, RS the approximate linear part of the field curve and ST the saturated region. If the shunt field resistance is represented by the line OQ, then P is the stable operating point. Suppose now an additional field winding† is separately excited, cumulatively, by an amount O′O so that the terminal voltage in the absence of the shunt field and due to O′O only is ON. If the abscissa of the graph is still meant to indicate the exciting ampere-turns of the shunt field winding only, then the effect of

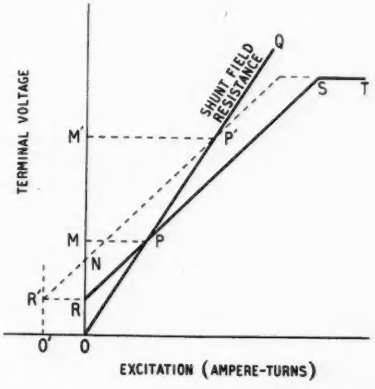


Fig. 1.—Straight line voltage characteristic graph

* Elect. Eng. Dept., Manchester University.

† A suitable winding is a series field in a compound machine.

this addition is to move the curve RST to the left by an amount O'O. The operating point for the output voltage is now P' and has risen from P because of the influence of the external field O'O. Thus if the amount of the external excitation O'O is varied the output voltage will vary along the line OQ.

In the absence of the shunt field the voltage change for an excitation O'O is RN and with the shunt field connected the voltage change is MM'; hence the amplification produced is the ratio MM'/RN. If the slope of RS is equivalent to the resistance R_C, say, and the resistance of the shunt field is R_S then it can easily be shown that $MM'/RN = R_S/(R_S - R_C)$. This would suggest that the amplification could be made as large as required by making R_S as close to R_C as possible. In practice this is not so owing mainly to the fact that RS is by no means linear and that hysteresis occurs, so that the descending curve is not the same as the ascending one.

If the shunt generator were to be used as any form of open loop amplifier, i.e., in a system without feedback, then these two factors would be sufficient to make it unusable. A third adverse factor is the response time; if the current in the external (or control) winding is changed suddenly from one level to another then the output voltage rises approximately exponentially with a time constant inversely proportional to the difference between R_S and R_C. Since R_S is made as nearly equal to R_C as possible in order to obtain a large amplification then the time constant is extremely large and the response slow. However if the shunt generator is connected in a feedback system, such as will be described later, it is possible to obtain satisfactory amplification and at the same time achieve quick response.

Constant Current Generator

As an example the generator-amplifier is described in use in a system in which the load on the generator may vary considerably, but the current must remain sensibly constant at a predetermined value. The circuit diagram (Fig. 2) shows that the shunt generator causes a current I to flow through the variable load and a comparison resistor R'. If the voltage IR' across this resistance is exactly equal to the battery voltage E_R then current will not flow in the control winding. In the actual tests this winding was the series winding of a compound machine. If, however, the load changes and the current tends to change then IR' will no longer equal E_R and a current will flow in the control winding in such a direction as to increase or decrease the output voltage (using the amplification property of the generator) and bring the load current back to the original value.

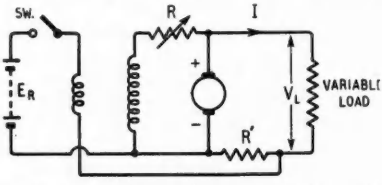


Fig. 2.—Diagrammatic representation of constant current system

A simple analysis will make the performance more easily understood. An elementary precaution must be taken in the initial setting-up procedure and in the shutting down. A switch Sw must be provided in the reference voltage circuit for when the generator is not running or excited the control winding and the comparison resistor R' form a low resistance closed circuit. It is essential that the generator be running before the switch is closed and that the switch be opened again before the generator is shut down. As the shunt field resistance is smaller than the critical resistance, it is necessary to provide a suitable variable resistor R in series with the field in order to get the total resistance of the same order as the critical resistance.

If the total resistance is R_s and the shunt field inductance L_s, then if e_t is the instantaneous terminal voltage the field current i_f is given by:

$$i_f = e_t/(R_s + L_s p) = e_t/R_s(1 + T_s p) \quad \ldots \quad (1)$$

where $T_s = L_s/R_s$ is the shunt field build-up time constant.

If the slope of the magnetization characteristic is R_c (see Fig. 1) then the terminal voltage produced by a field current i_f is:

$e_t = R_c i_f +$ "OR" $= R_c(i_f + a)$, writing R_c for OR. If now a control current i_c flows in the control winding and if N is the turns ratio of shunt field to control field then i_c/N is the equivalent current in the shunt winding and the terminal voltage becomes:

$$e_t = R_c\{i_c/N + i_f + a\} \quad \ldots \quad \ldots \quad (2)$$

Eliminating i_f between equations (1) and (2) gives the output voltage in terms of the control current:

$$e_f = \frac{\alpha R_c(1 + T_s p)}{(1 + \alpha T_s p)}\{i_c/N + a\} \quad ..(3)$$

where $\alpha = R_s/(R_s - R_c) >> 1$

From the transient response point of view the constant "a" can be removed from the equation as it only determines a starting level (i.e., the level OM in Fig. 1). Hence equation (3) becomes:

$$e_f = \frac{\alpha R_c(1 + T_s p)}{N(1 + \alpha T_s p)} . i_c \quad .. \quad (4)$$

Assume for simplicity that the load is a pure resistance R_L, then the load current is given by:

$$I = e_f/(R_L + R') \quad .. \quad .. \quad (5)$$

The reference voltage E_R can also be written as $R'I_D$ where I_D is the required or demanded current.

Now the current i_c through the control winding is determined by the difference between the reference voltage $E_L = I_D R'$ and the voltage across the comparison resistor R':

$$i_c = (I_D - I)R'/R_0(1 + T_0 p) \quad .. \quad (6)$$

where R_0 is the control field resistance and T_0 the control field build-up time. Thus the complete operational expression for the system is obtained from eqns. (4), (5) and (6):

$$I = \frac{\alpha R_c R' (1 + T_s p)}{N(R_L + R')\ R_0\ (1 + T_0 p)(1 + \alpha T_s p)} \times (I_D - I)$$

or rewritten with $m = R_c R'/N(R_L + R')R_0$

$$\left[\frac{T_0 T_s}{m} p^2 + \left\{\frac{(T_0 + \alpha T_s)}{\alpha m} + T_s\right\} p + \frac{1 + \alpha m}{\alpha m}\right] I = \left[1 + T_s p\right] I_D$$

This equation is a quadratic in "p" and since all the coefficients are positive and greater than zero even if α is negative (i.e., $R_s < R_c$) the system must be inherently stable.

Some simplification can be made if, as was the case for the test machine

$$m > 1 \qquad \{m \simeq 6$$
$$\alpha > 1 \qquad \{\alpha \simeq 20\}$$
$$T_0 < T_s \qquad \{T_0 \simeq T_s\}$$

in order that the important feature may be emphasized.

The p^2 coefficient is smaller than that of p, and T_0 is small compared with αT_s, while $1 + \alpha m \simeq \alpha m$, hence equation 7 can be reduced very approximately to:

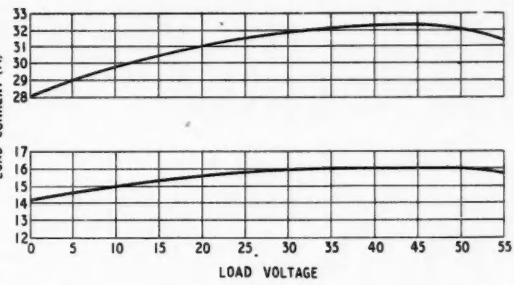


Fig. 3.—Current characteristic curves for variable load

$$\left[\left(\frac{1 + m}{m}\right) T_s p + 1\right] I = [1 + T_s p] I_D \quad (8)$$

Thus it is seen that the important time constant is $T_s(1 + m)/m$, the most important fact being that this is independent of α for, as already stated, to make the amplification large R_s must be made nearly equal to R_c, making α very large and in the open loop case making the response time excessively large. In the closed loop case, however, the response time is independent of α and theoretically the gain could be made infinite without affecting the response time.

In the steady state when the rates of change of current have ceased then from equation (7) equating p to zero:

$$\left\{\frac{1 + \alpha m}{\alpha m}\right\} I = I_D$$

or the error $I_D - I = I/\alpha m$

Since αm can easily be made greater than 100, then the steady state error is less than 1%.

In the system tested the machine was rated at 5 kW at 100 V and run approximately at 1,500 r.p.m. by a d.c. motor. The speed was not corrected at all during the experiment, but allowed to drop with increasing load. The reference voltage E_R was a bank of accumulators and the comparison

resistor one ohm. The graph (Fig. 3) indicates the current variations as the load resistor was altered, the maximum control current being not greater than 200 mA. The resistance of the control winding was 0·133 ohm and the maximum control power 5×10^{-3} W. It must be pointed out, however, that for satisfactory response the transient control current capable of being drawn from E_R must be much greater than in the steady state. The performance could undoubtedly be improved* by using a larger number of turns on the control winding with correspondingly less current. However the test was carried out on a normal machine in which the series winding used for compounding was isolated and used as the control winding; thus the conditions were not optimum and (as seen in Fig. 3) the total variation over a wide range did not exceed $\pm 3\%$ at 15 A or $\pm 8\%$ at 30 A.

The constant current device has been analysed fully, but it is not the only control circuit that can be used round the shunt generator amplifier. In fact a voltage follower system can be achieved quite simply by connecting the control field, not to a resistor R (which is now unnecessary) but to the positive side of the generator so that the generated terminal voltage is compared with the reference voltage. In the experimental model E_R was raised in steps with the load resistance constant, the te minal voltage followed with a lag of approximately 0·2 sec. and a final steady state accuracy within 0·1%. This simple system, however, does not operate satisfactorily as a constant voltage regulator for varying loads and speed changes unless an additional series field is used to compound the machine for compensating approximately for the armature resistance voltage drop at high current levels.

* Since this article was written a paper by E. A. Binney has been published in the *English Electric Journal*, Vol. XI, No. 3, p. 71, describing a machine, working on this principle, designed specially for linearity and high gain.

I.E.E. Liverpool Dinner

THE annual dinner of the Mersey and North Wales Centre of the Institution of Electrical Engineers took place at Liverpool on 13th November. Mr. J. Eccles, chairman of the Centre and of the Merseyside and North Wales Electricity Board, presided.

Lord Citrine, chairman, B.E.A., was the principal guest. After mentioning his local associations he explained that the output of electricity had increased by 25 per cent since nationalization. The maximum output capacity of stations at the beginning of November was 12,806,000 kW and the number of consumers about 12,800,000, an average of about 1 kW per consumer. Of this, in January last some 10·4 per cent was out for maintenance, compared with 16 per cent in previous years and 30 per cent in the summer. When it was remembered that there were some 15 million electric fires of 1 to 3 kW, it was apparent that even with the most careful use by consumers an enormous load increase could take place during cold weather.

Lord Citrine also said that the construction of the 275 kV grid essentials was expected to be completed in 1955 and they were also working on a scheme for energy generation at the collieries with a 380 kV transmission system to the main network. It was estimated that 25,880 MW of plant would be needed in 1960 and 30,000 MW in twenty years time. To deal with the peak load gas turbines were expected to be in operation by the end of next year and by 1970 they expected to produce 1 to 1½ million kW at peak times by this means. Some half a million kW of wind power might be available ultimately. Load levelling by means of centralized control systems was a doubtful economic proposition. Load shedding would persist for some years yet until the productive capacity of the generating plant industry and in particular boiler plant caught up with the demand.

Sir Archibald Gill, President, I.E.E., in his response to the toast on behalf of the Institution, called attention to the advances in which this country had led the world and he instanced the first submarine cable of 100 years ago and the first underwater amplifier in 1943. He said one such amplifier in a length of cable halved the effective length and therefore quadrupled the capacity.

The toast of " The Guests " was proposed by Mr. T. B. D. Terroni and the Lord Mayor of Liverpool, Alderman H. D. Longbottom, in his reply pleaded for consideration for the needs of the consumer and pointed out that production was for humanity not humans for production.

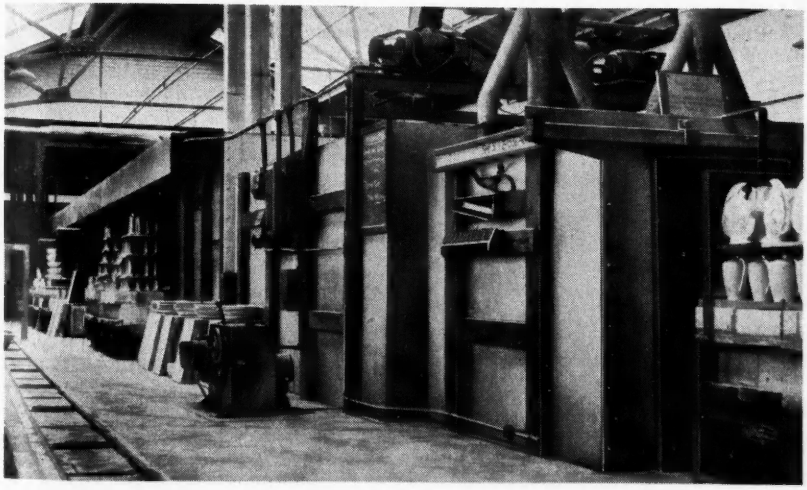
Pottery Firing

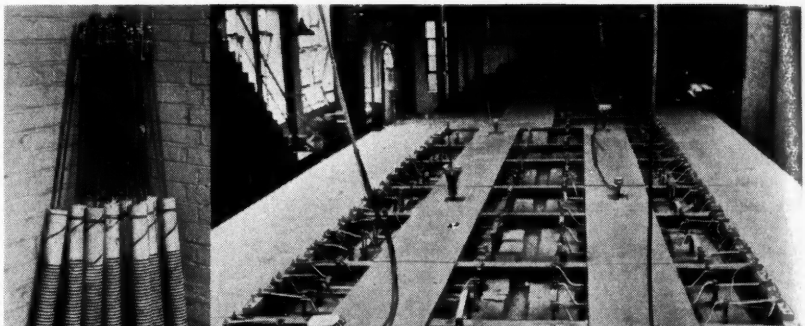
Twin-tunnel Combined Biscuit and Glost Kiln

AS part of a comprehensive scheme of modernization and electrification which Carter, Stabler & Adams, Ltd., have been carrying out during the past three years at their pottery works at Poole, Dorset, a twin-tunnel kiln has been installed for firing earthenware biscuit and glost simultaneously. This kiln, which is the first British-made combined unit of its kind, is 97ft 6in long, each tunnel being 4ft 6in high by 1ft 8in wide and having a firing space 1ft 6in square. Twenty 4ft 6in trucks can be accommodated each side, the firing cycle taking approximately 50 hours for biscuit and 30 hours for glost. Biscuit is fired at a maximum temperature of 1,150 deg C, glost at 1,050 deg C.

The heating elements, which are composed of 0·128in diameter 80/20 nickel-chromium elements on special refractory formers, are located vertically in the kiln, sixty each side, and are readily interchangeable from the top of the kiln. Primary control of the voltage is obtained by means of two Gresham

Above: Electroflo three-point indicating controller and recorder with additional multi-point distance thermometer attached on the right. Below: Twin-tunnel kiln showing "Controvec" system and driving gear for pushing mechanism





Left : Nickel-chromium elements used in the kiln. Right : The top of the kiln (covers removed) showing arrangement of the heating elements and the thermocouples

3-phase auto-wound tap changing transformers, one for each tunnel, which with the aid of six-position rotary switches give a range of voltages to suit the heating elements. The 440 V supply to the transformers and also the main supply to the building are controlled by Ellison circuit breakers. Temperature control is effected by means of an Electroflo three-point indicating controller and recorder operating in conjunction with duplex thermocouples and Brookhirst contactors to switch on and off three banks of elements in each section of the kiln.

Further supervision of firing conditions is made possible by the provision of an additional five-point remote temperature indicator, desired adjustments of temperature in any particular zone being carried out manually. By these means the operator is enabled to adhere closely to a predetermined firing cycle prepared for him visually in the form of a graph.

Considerable economy in electricity consumption is obtained by the incorporation in the kiln of the " Controvec " system which, by means of fans and ducts, prevents the seepage of hot air out of the ends. Normally the loading of the kiln, which is in continuous operation, is 75 kW for biscuit and 50 kW for glost, the maximum demand (recorded on an Aron meter) being about 125 kW. The annual consumption is approximately one million kWh.

The trucks (in the two chambers of the kiln) travel in opposite directions, thus taking advantage of the recuperative effect of such a system. The pushing gears, which incorporate continuous chains underneath the trucks, are driven by Brook 1 h.p. 940 r.p.m. motors through reduction gearing and clutches. Audible warnings are given when the trucks are ready for removal from the ends of the tunnels—a horn for the biscuit side and a bell for the glost, both supplied by Gent & Co., Ltd.

The kiln was installed by Gibbons Bros., Ltd., Dudley, some auxiliary electrical work being carried out by Aish & Co., Ltd., Bournemouth. We thank Mr. R. T. Holland, director of Carter, Stabler & Adams, Ltd., for permitting us to inspect the installation.

All-Electric Laundry

LEEDS Corporation recently opened a block of 84 new flats at Sweet Street, Holbeck, which includes an all-electric laundry. The washing room of the laundry contains eight Burco 3 kW washboilers, two centrifugal dryers with 3 h.p. 3-phase motors, and a cylinder with nine 9 kW, 3-phase " Bray " immersion heaters controlled by contactors through " Satchwell " thermostats. It is intended to lag the cylinder after a short period of running in, when all joints have proved efficient. Six " Vent Axia " 12in fans are fitted to remove steam. The drying room, which is ventilated by two similar units, contains a battery of eight drying horses. Two ironing tables are provided. each with two Downing ironing units with cordless irons.

Further Education for the Profession

The I.E.E. Advisory Service

By **M. W. Humphrey Davies**, M.Sc., A.M.I.E.E.*

THE Further Education and Training Scheme operated for ex-Service personnel by the Ministry of Labour, assisted by the Ministry of Education, is now in its final phase, and the various special courses to which it gave rise will shortly be coming to an end. It is an opportune time to consider how far the courses for electrical engineers have succeeded in attaining their objectives and whether there is anything to be learnt from them that would be of permanent value in our educational system.

As soon as it became practicable to begin to discuss plans for post-war development the view was accepted that in preference to lowering for ex-Servicemen the standards of entry to the various trades and professions, it would be better to make special provisions to assist those whose education and training had been interrupted to obtain full qualifications as rapidly as possible, so a scale of grants was devised to cover the grades required and allow for family commitments.

Adaptation of Wartime Scheme

It will be recalled that in 1941 the Council of the Institution of Electrical Engineers had appointed a Post-war Planning Committee and that after a series of I.E.E. meetings at which a paper by Sir Arthur P. M. Fleming had been discussed, a report containing recommendations concerning post-war problems in the education and training of electrical engineers was issued in April, 1943. This was followed in December, 1944, by a second report in which the needs of ex-Servicemen were examined more fully. As a result of these deliberations the Council of the I.E.E. welcomed the proposal put forward by the Ministry of Education for an adaptation of the wartime scheme of "intensive courses" for National Certificates in Electrical Engineering to cater for those who were either unqualified to enter universities or were unable to obtain places therein.

That six-month course, which had been designed to lead to the award of a Higher National Certificate, was only open to those who had already obtained an Ordinary National Certificate by part-time study. While it had served its immediate purpose of providing a steady flow of young technicians, there had been complaints that it was too intensive and less effective than the part-time courses in providing professionally qualified engineers.

Industrial Experience

It was decided that the new courses, confined to ex-Service candidates, should be open to all those who had completed the first two years of an O.N.C. course or had a suitable school certificate. There were two parts, each lasting eight or nine months and leading respectively to the award of Ordinary and Higher National Certificates. An important feature of the scheme was the requirement that at least six months should be spent in industry between the two parts of the course. The longer course and the intervening spell in industry were intended to overcome some of the weaknesses of the wartime intensive schemes, although it was appreciated that the period in industry might prove difficult to arrange for those who were not already associated with a particular firm.

To assist young electrical engineers to make the best use of the F.E. and T. scheme, the I.E.E. instituted an advisory service to enable anyone who applied to the secretary for advice to be given, besides some formal information, a list of members of the I.E.E. who would be willing to see the applicant and discuss his problems in detail. This arrangement proved particularly useful when the F.E. and T. scheme was extended to include practical training.

In spite of careful planning, the *ad hoc* nature of the above schemes and other difficulties inherent in the demobilization period must have meant that some failed to hear of these schemes and that others were unable to make full use of them; but there is no doubt that through their existence

* Lecturer in Electrical Engineering, Imperial College of Science and Technology, South Kensington, London.

many individuals, and the electrical engineering activities of the country as a whole, have benefited.

The success of the intensive courses has already led to the establishment of improved "engineering cadetship" schemes in some of the special branches of the Services. Somewhat similar schemes are also being tried out in industry; these may be called "sandwich" courses, for periods of full-time study at a college are sandwiched between longer periods in industry. Various arrangements have been tried in this country and elsewhere from which it appears that the period of full-time study should comprise at least ten consecutive weeks and that there should be at least one such period per year. Various kinds of "short" courses and even postal tuition may be satisfactory for teaching a particular technique, but there is no doubt that a proper understanding of the fundamental principles, from which special techniques are developed, cannot be achieved without a substantial period of personal tuition, combined with experimental work in a teaching laboratory. Once good foundations have been laid in this manner a capable pupil will be able to make much better use of such written instructions as may be necessary. It is therefore to be hoped, in the interests of apprentices and younger technical staff who are unable to attend evening classes or for whom release on, say, one day a week would be difficult to arrange, that industrial organizations concerned will follow the lead that has already been given and approach technical colleges to provide intensive courses, involving one or two terms per annum (each of about ten weeks) for two or more years, according to the nature of the course. When arranged on this basis the course will have the further advantage of being available to students not normally resident, or working, within easy travelling distance of the college.

An extension of the advisory service of the I.E.E. also seems desirable and it will best be achieved if those who are in difficulty with their technical education or training will write to the secretary of the I.E.E. for advice. Although the full development of the service might take some years, the rate of improvement should be directly proportional to the use that is made of it.

South African News

From our Cape Town Correspondent

THE South African Bureau of Standards states that manufacturers complying with the specification for tungsten filament general service electric lamps published early this year by the Standards Council may, by arrangement with the Council, apply its standardization mark to their products.

Aberdare Cables, Ltd., Port Elizabeth, have a £60,000 order in hand for electricity undertakings in Finland, and it is expected that a number of other large export orders will be received. Sir George Usher, chairman of this South African company, said that the order from Finland was obtained in the face of competition from Britain, including Aberdare Cables in Wales. The Port Elizabeth factory is now exporting cables to the Far and Middle East and to a number of neighbouring African territories. Telephone cables are also being made in the factory.

Low-voltage high rupturing capacity fuses are now being made by H.R.C. Fuse Gear, Ltd., in collaboration with Electric Transmission, Ltd., England. At present four sizes are in production, having ratings of 60, 150, 200 and 300 A. These are to be followed by higher ratings and h.v. fuses. These fuses have the same fixing centres as other well-known makes and similar overall dimensions and will, therefore, fit the same fixtures.

The small quota of imported refrigerators (some electrical firms have no quota) would have been quite inadequate to meet the summer demand. Almost all pre-import control stocks have been sold out. Now the local manufacturers are going all out to relieve the situation and some factories have been in production for a few months. One of the largest firms, which assembles British and Swedish built machinery in locally made bodies, was to start producing refrigerators at the beginning of October. A year or two must elapse, however, before enough South African refrigerators are produced to supply the whole Union market. The electrical trade also fears a serious shortage of washing machines. Electric stoves, electric irons and other appliances are made in the Union in large enough numbers to keep the market satisfied and as they are now being made to high quality standards the average purchaser is willing to accept them. Stocks of electric vacuum cleaners and polishers are stated to have risen slightly of late. A British electric kettle is still doing well on the local market.

Coal Plan

Survey of Power Requirements

LAST week the National Coal Board published its "Plan for Coal" (price 2s 6d), containing proposals for the development of the mining industry over the next fifteen years at an estimated cost of about £635 million.

In the Plan a survey is made of possible future demands. The British Electricity Authority will require 40 million tons annually by 1955 and possibly 45 million tons by 1960, rising to 60 million tons by 1975.

An appendix dealing with the main lines of technical progress quotes the conclusion of the Reid Committee that "new mines should be laid out on an all-electric basis and wherever practicable the complete electrification of existing mines should be seriously considered." The Coal Board says that although some existing steam plant will be retained for many years and there are sometimes technical difficulties in changing over, in the main steady progress towards the electrification of surface plant is planned. Underground, the power media are compressed air and electricity, but a steady reduction in the use of compressed air may be expected.

Collaboration with B.E.A.

It is stated that the provision of cheaper power is an essential part of reconstruction and modernization and close collaboration between the Coal Board and the B.E.A. will be needed. At present the demand for electric power amounts to about 942,250 kW; of this 457,600 kW is met by Electricity Boards and 484,650 kW by the Coal Board itself. The Board's plant comprises 895 steam-driven sets in 379 stations with an installed capacity of 872,399 kW. Most of the plant is old, obsolete and inefficient and the tendency has been towards taking a public supply.

The consumption of electricity per ton of coal mined ranges from 10 kWh where the workings are shallow to 40 or 50 kWh at deeper collieries; it is estimated that the average is 30 kWh per ton. With an annual production of 240 million tons of saleable coal, power consumption would thus be somewhere between 7,500 and 10,000 million kWh a year. At an average load factor of 45 per cent this is equivalent to a maximum demand of between 1·9 and 2·5 million kW. A table shows the estimated demands of the divisions by 1955 which total 1·29 million kW.

With regard to the disposal of low-grade fuels and fines the conclusion is reached that probably the most efficient way of using much of this would be in the big power stations of the B.E.A. wherever large quantities are available, the quality is consistent and transport charges are not heavy. It is recognized that conditions may not always permit this.

Other low-grade fuels might be burned in pithead stations but these could not work at full load unless, in special circumstances, there was an inter-colliery network or the stations were run in parallel with the grid. Such stations would be larger than existing colliery generating stations and the plant for them should be standardized. Two arrangements are suggested:—(*a*) a single unit and (*b*) a central station with two or more units. Consideration is given to the advantages and disadvantages of pithead generation.

The Board estimates (on mid-1949 prices) that generating costs, including capital charges (with a figure of £50 per kW), will be between 0·5d and 0·8d per kWh, depending upon the ash content of the fuel. No account is taken of incidental savings.

There may be a case for the burning of coke breeze for generating electricity and process steam where coke oven plant is operated near collieries.

Festival Celebrations

BEDFORD Corporation Parks and Public Buildings Committee has approved a plan for illuminating both sides of the river bank between the town bridge and the suspension bridge, both bridges, Duckmill Island, the island east of the suspension bridge and three flower beds on the embankment during approximately seven weeks next summer and early autumn, as part of the Festival of Britain programme.

Public Works Exhibition

Electrical Aids to Municipal Services

WHILE there were few exclusively electrical displays, most of the 254 stands at the Public Works and Municipal Services Congress and Exhibition held at Olympia, London, last week, contained some items of electrical interest.

Building and road making equipment provided by far the most extensive class of exhibit and ranged from electric copying frames for draughtsmen to a Stothert & Pitt 15 ton/hr mobile electrically operated asphalt plant. One new application of electricity, which appears to have possibilities in the electrical contracting industry as well as in building, was the adaptation by Victor Products (Wallsend), Ltd., of a mining drill for boring holes from 1½in to 4in in diameter and up to 12ft deep at high speed and without vibration or clouds of dust. The same company has also introduced a new hammer drill, as well as ranges of flameproof and unbreakable lighting fittings.

Among concrete making equipment, great interest was taken in the Winget "Mechanical Moke," an exceptionally mobile electrically driven barrow, designed to supersede hand barrows for short hauls on building sites. The laying of electric conduits, etc., in concrete is facilitated by the Wiggins-Sankey "Ductube" process whereby a specially designed inflatable rubber tube is laid in concrete in any form desired, and when the concrete has set is deflated and removed.

Bricklaying operations should be greatly speeded up by the adoption of the Warry Patent Building Equipment Company's universal platform hoist, which is quickly extensible up to 80ft, incorporates a safety gate, can be put up and in operation in one minute and can be pushed over the roughest site by only three men.

E.D.A. Stand

The convenience and hygienic qualities associated with the use of electricity were stressed in a display arranged by the British Electrical Development Association, a special feature presenting the case for making adequate provision for electrical services in new housing estates. Progressive municipalities are looking ahead to the time when the housing problem is solved and when it will be difficult to let a house which is without provision for using electricity for all purposes.

The largest portion of the E.D.A. stand, however, was occupied by an all-electric kitchen suitable for a school with 250 pupils. The display was shown at this exhibition two years ago and attracted so much attention that it was included again. The remainder of the stand was devoted to a display of some of the latest designs of fluorescent lighting lanterns, together with photographs and data on efficiency and running costs.

Traffic Equipment

The "Rythmatic" ripple control equipment for street lighting, selective load control, etc., was demonstrated by the Automatic Telephone & Electric Co., Ltd., which also showed the "Electro-matic" traffic control apparatus, a private automatic telephone exchange, press button intercommunication systems and sound amplification distribution equipment. Other equipment concerned with road safety included time switches (shown by the Horstmann Gear Co., Ltd.), portable floodlights and traffic signs, among which Gowshall, Ltd., introduced the new "Signlite" fitting designed to light evenly a whole range of sign sizes. A paper on "The Background of Street Lighting" was presented to the Congress by Mr. E. J. Stewart, inspector of lighting, Glasgow.

Pumping, filtration, control and recording equipment for water and sewage were well represented. In a demonstration by Stewart & Lloyds, Ltd., of the anti-corrosive efficiency of bituminous internal and external protection of steel pipes and galvanized coating, a 4ft length of 2ft dia. pipe with a standard seamless bitumen asbestos sheeting was tested by a 10,000 V "Holiday" spark apparatus.

Tomlinson (Electric Vehicles), Ltd., indicated the possibilities of the pedestrian controlled electric truck, not as an alternative to the conventional refuse collecting vehicle but as an economic means of door-to-door collection in congested areas a reasonable distance from the central plant or main collecting point, thus releasing a larger vehicle for more extended duties.

PERSONAL and SOCIAL

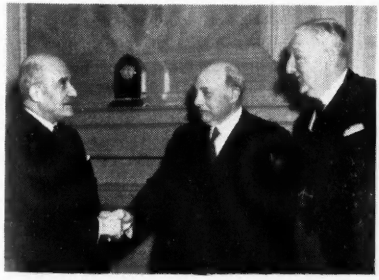
News of Men and Women of the Industry

THE King has approved recommendations made by the Council of the Royal Society for the award of a Royal Medal for the current year to **Sir Edward Appleton**, G.B.E., K.C.B., F.R.S., for his work on the transmission of electromagnetic waves round the earth and for his investigations of the ionic state of the upper atmosphere. The president and the Council of the Society have awarded the Copley Medal to **Sir James Chadwick**, F.R.S., for his outstanding work in nuclear physics and in the development of atomic energy, especially for his discovery of the neutron.

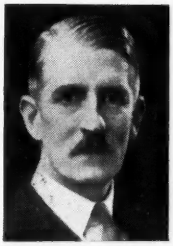
Mr. N. L. Keen, for many years sales manager of the Bowthorpe Electric Co., Ltd., and its associated company, Hellermann Electric, Ltd., has been appointed a director of both companies.

Mr. S. H. Cass and **Mr. F. A. J. Ryde** have recently retired from the General Electric Co., Ltd., both having completed fifty years with the company. Mr. Cass joined the company in 1900 in the Bought Ledger Department and remained there until 1916 when he joined the Wire and Cable Department, later becoming senior assistant to Mr. L. Smith, manager of that Department. Mr. Ryde joined the company in 1899 and after fourteen years in the Wire and Cable Department was appointed in 1916 manager of the company's cable stores at Southampton, a position he held for thirty-four years. In the accompanying picture we show Sir Harry Railing, chairman of the G.E.C., receiving Mr. Cass and Mr. Ryde.

Sir Harry Railing receiving Mr. S. H. Cass and Mr. F. A. J. Ryde, who have retired after fifty years with G.E.C. Sir Harry is shaking hands with Mr. Cass



Mr. C. H. Sparks, who has been chief engineer of Babcock & Wilcox, Ltd., since 1936, is retiring from that position at the end of this year. He will continue as a director and will also continue to serve the company in a consulting capacity. **Mr. W. F. C. Schaap**,



Mr. C. H. Sparks

Mr. W. F. C. Schaap

at present deputy chief engineer, will be appointed chief engineer of Babcock & Wilcox, Ltd., as from 1st January next.

Mr. T. Coughtrie, chairman and managing director of the Belmos Co., Ltd., has been appointed to the boards of Aurora Lamps, Ltd., Old Kilpatrick, Glasgow, and British National Electrics, Ltd., Newarthill, Motherwell.

Mr. C. F. Barnard has been appointed assistant general manager of the National Gas & Oil Engine Co., Ltd. He held a similar position with Mirrlees, Bickerton & Day, Ltd., and before that was with Boulton & Paul, Ltd., and Blackstone & Co., Ltd.

We are asked to make it clear that the appointment of **Mr. B. I. Powell** as sales manager by William McGeoch & Co., Ltd. (*Electrical Review*, 17th November), relates to the Birmingham Works (Midland Area) only.

Mr. A. H. Mulder, who has recently completed twenty-five years' service with Philips Electrical, Ltd., has been appointed industrial manager for the Midland area.

On 17th November, Mr. D. G. E. Barrie, governing managing director of **Metway Electrical Industries, Ltd.**, gave his annual review to employees of the year's trading of the company. Mr. Barrie said that while

there was only a slight drop in turnover, increased overheads had reduced the net profit by a considerable amount. He had decided, however, to again pay the staff a 15 per cent bonus on their gross earnings for the year, plus an additional ½ per cent for each complete year's service. After the distribution of the bonus a collection was made for the E.I.B.A. A dinner was held in the evening for the executive staff and a dinner-dance for the staff will be held on 16th December.

Mr. B. Hallows-Garside, M.I.E.E., M.Amer.I.E.E., has been appointed director and general manager of Dalton & Co., Ltd., refiners, re-refiners, blenders, etc. Mr. Garside recently resigned from the position of managing director of the Britannic Electric Cable & Construction Co., Ltd., and was previously with Crompton Parkinson, Ltd., for nearly twenty years, holding the positions of director and general manager of Derby Cables, Ltd., and general manager of the Chelmsford Works.

Collins Electrical, Ltd., held their annual dinner and dance at the Ardington Rooms, Clapham Junction, on 17th November, over 200 members of the staff and friends attending.

In the absence of the founder of the firm, Mr. C. F. Collins, A.M.I.E.E., owing to illness, Mr. C. E. Collins, managing director, was in the chair and in the speeches that followed the dinner sympathy and best wishes for Mr. C. F. Collins' future good health were expressed. Mr. A. C. G. Witts, B.Sc.(Eng.), A.M.I.E.E. (Bowater-Lloyds) in proposing the toast " The Firm " emphasized the spirit of co-operation that existed between the two companies, and Mr. R. W. Philps responded. An excellent cabaret, followed by dancing, rounded off a successful social function.

OBITUARY

Mr. Gordon Grainger, M.I.E.E., chief works engineer of J. A. Crabtree & Co., Ltd., Walsall, died on 13th November at the age of fifty-four. Mr. Grainger received his technical education at the Liverpool Technical College and Liverpool University, and served his apprenticeship with F. B. Hellon & Co., Ltd., Liverpool. His first engineering appointment was with Cammell Laird & Co., Ltd., and he later saw service with the Vickers Naval Construction Co

The late Mr. Gordon Grainger

At the outbreak of the 1914-18 war he joined the Royal Garrison Artillery and later was commissioned in the Royal Air Force. He joined the Crabtree company in 1923 and was closely associated with the late Mr. J. A. Crabtree in the planning and development of Lincoln Works. Mr. Grainger was the author of many papers on plant performance and electrical research. He was a member of the British Institute of Foundrymen, a past member of the Institute of Production Engineers and the Institute of the Plastic Industry. He was at one time associated with the Association of Supervising Electrical Engineers, was local technical representative for the Electrical Power Engineers' Association, and served on the local advisory committees both for Education in the Electrical Industry and the National Register of Electrical Installation Contractors.

Mr. T. Meade.—The death has occurred at Heaton, Newcastle-on-Tyne, at the age of sixty-six of Mr. Thomas Meade, a director of Campbell & Isherwood, Ltd. Mr. Meade this year completed fifty years' service with the company.

WILLS

Mr. W. H. Trace, joint founder of W. H. Trace & Son, electrical contractors, who died on 17th May last, left £1,068 gross (£1,009 net).

Mr. E. Powell, a director of William E. Powell, Ltd., electrical contractors, Tunbridge Wells, who died on 12th August, left £19,029 gross (£18,730 net).

Mr. W. D. Reid, late technical director of Skelmorlie Electric Co., Ltd., and chief engineer for Scotland to the former Callender's Cable & Construction Co., Ltd., who died on 21st May last, left personal estate in England and Scotland valued at £5,004.

Mr. F. F. Turner, formerly manager, Newcastle branch, Philips Electrical, Ltd., who died on 24th July last, left £3,145 gross (£3,092 net).

Mr. G. B. Melton, A.M.I.E.E., M.I.F., generation engineer (construction), B.E.A. Yorkshire Division, who died on 6th March last, left £16,740 gross (£16,077 net).

TRICITY COOKERS

WE are informed that the British Electricity Authority has sold the business of Tricity Cookers, Ltd., to Thorn Electrical Industries, Ltd. The Tricity concern claims to have made the first electric cooker in 1906. A controlling interest in the company was acquired in 1946 by the County of London Electric Supply Co., Ltd., ultimately vested in the B.E.A. which has operated the Tricity business until now. Thorn Electrical Industries state that the production of Tricity cookers will be considerably expanded, but that the marketing policy will remain unchanged.

Diesel-Electric Pilot Vessel

DURING last month the new 165ft single-screw diesel-electric pilot tender *Sir Thomas Brocklebank*, which has been built for the Mersey Docks and Harbour Board by Philip & Son, Ltd., Dartmouth, to the design of Graham & Woolnough, of Liverpool, ran successful sea trials in Start Bay. The emphasis on economy and reliability of machinery usually concern the normal sea speeds, but for this pilot service they are equally important at the very low speeds necessary over long periods while on station, when the propelling power may only be of the order of 3 per cent of full power. This is achieved with the diesel-electric arrangement because the loading of the tandem coupled auxiliaries provides the desirable 20 per cent minimum engine power output, without affecting the full speed condition. Part of this load is provided during low speed operations, or when the vessel is merely stemming the tide "on station," by the heating and ventilation system which, at other times, is heated by the Crittall warm air system.

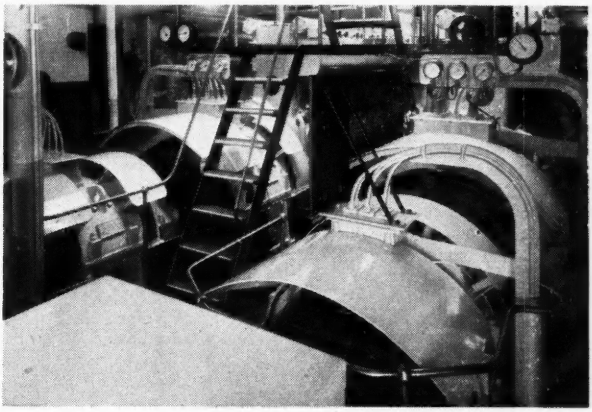
The main machinery contractors were the General Electric Co., Ltd., who provided the electrical equipment, and the engine builders, the National Gas and Oil Engine Co., Ltd. There are two propulsion generating sets each comprising a six-cylinder diesel engine direct coupled to the d.c. main and auxiliary generators in tandem. Either of the two main engines has adequate power for a full 10 knots in service.

The capacity of each main generator is 375 kW, and of each auxiliary generator 80 kW, when running at from 465 to 520 r.p.m. The auxiliary generators can maintain the ship's line voltage at 220, at any engine speed within this range and provide power for lighting, heating and auxiliaries as well as for excitation of propulsion units. There is also a 40 kW 220 V d.c. set for port use and standby duties driven by a three-cylinder 70 h.p. 850 r.p.m. diesel engine.

The main generators may be connected singly or in series to a single armature motor, capable of developing 920 b.h.p. at 300 r.p.m., coupled to the propeller shafting through a Michell thrust block. The speed and direction of the propulsion motor are controlled by one main hand-wheel on the front of a control desk. The main control equipment has been divided, segregating the isolator switches from the motor control desk. The isolators are of the drum type, mechanically interlocked with the main control wheel.

Power for the excitation circuits and for the propulsion motor cooling fan is supplied through a latched master contactor controlled by a small master control wheel on the top of the desk. This contactor will open to shut off power in the event of persistent excessive overload and can be closed only with the main control wheel in the "Off" position and with the generator selector switches correctly set.

The main control wheel gives seven steps ahead and astern and on the first or second step a secondary wheel gives vernier adjustment of revolutions between about 100 and 125 r.p.m., to give fine adjustment of ship's speed at about 4 knots when keeping station.



Main engines with tandem coupled 375 kW and 80 kW generators

VIEWS on the NEWS

By REFLECTOR

A FORMIDABLE task confronts the sub-committee appointed by the Conservative Fuel and Power Committee to make recommendations for the denationalization or part-denationalization of the gas industry. It would be quite a feat to reconstitute the eggs from which this omelette was made but evidently it is thought to be possible to restore some at least of the original units to private or municipal ownership. The gas industry is certainly not so closely knit as electricity supply which, on the generation side, is really a national organization. But even if gas cannot be denationalized in England one Member of Parliament thinks that it can be done in Scotland. A Private Member's Bill is to be introduced by Col. James Hutchinson "to restore to Scottish local authorities gas undertakings formerly owned by them."

* * *

When a manhole cover blew off the pipe-line leading to Grudie Bridge power station in Ross-shire a jet of water shot 150ft into the air and over the top of the power station, tearing branches off trees. One account of the incident says that a workman had the "presence of mind to close a valve, so reducing the pressure of the water which then fell on the glass roof of the power-house, flooding the basement and putting the machinery out of action." This seems to be setting a high price on preservation of the amenities.

* * *

While I have no doubt that the occasional power cuts which most people experience nowadays are sometimes very inconvenient and, on rare occasions, serious, it irks me to see how they are emphasized in the lay Press. They are very frequently partisan attacks on a nationalized service which may be all very well if recognized as such. Unfortunately they are likely to have very serious effects upon the whole of the electrical industry. It is frequently suggested that the supply is so unreliable that electricity users are lucky if they ever succeed in so much as boiling a kettle. For example, in a Burton-on-Trent paper a writer says that "it seems ridiculous that the Electricity Board should continue to persuade people to buy electric appliances when there is so little electricity to go round." He goes on to say that people who buy these appliances "will spend a considerable proportion of the winter gnashing their teeth over cookers and fires suddenly gone dead on them." Not only the Electricity Boards but all electrical people should do their utmost to counter this dangerous rubbish.

* * *

Speaking of Margaret Kennedy-Fraser's Hebridean songs in a Home Service broadcast talk last Sunday Maurice Lindsay referred to the impact of the twentieth-century upon folk music. For instance, he said, a soothing milking song, evolved to persuade the cow to give her last drop of milk, had no place in the modern dairy with its electric milking machinery. But who can fathom the mind of the cow? It may be that the hum of an electric motor is as acceptable to her as the crooning of a human voice.

* * *

In a letter to the *Daily Telegraph* Mr. G. Nabarro, M.P., disputed the claim of the B.E.A. that Stourport "B" was a new power station. He contended that it was merely an extension of the older station planned before the B.E.A. took over. As Mr. Nabarro was answered by the B.E.A. I do not intend to discuss this point, but I do thank him for a new collective noun; he referred to a "gamut of power houses." Perhaps the B.E.A. would prefer the term "a pride of power houses"; "amenity" preservers might use the word "plague."

* * *

Although I haven't seen it yet I imagine the new greetings telegram introduced by the Post Office must be very pretty. "It is coloured in pastel shades" (to quote a Post Office description), "and the design represents an open book (the book of life) surrounded by flowers on a blue and starry background. The envelope is lemon with a ribbon and foliage design on the left-hand side with birds."

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Power Failures

IT occurs to me that an incident which happened here in the City on 13th November may interest you, if only to illustrate how docile controls have made us.

At about 10.30 a.m. lighting failed and, as we noticed the same failure in neighbouring offices, we took very little notice beyond concluding that it was just another power cut. As time went on we began to feel chilly as our boilers are oil fired with electrically driven fuel pumps so they were also out.

After four hours of this it occurred to someone at about 2.30 p.m. to ring up the local authority, only to find them amazed and completely unaware of any cut. Apparently there had been a purely local failure and not a soul had complained. Within two minutes the supply was restored.

This only goes to show how completely numbed the British public has become under the influence of controls and cuts.

*London, E.C.*3. G. O. WATSON.

Fluorescent-Tungsten Lighting

REGARDING the announcements by B.T.H., G.E.C. and Philips on the new "chokeless" circuits, at first glance this seems such an obvious development that one is led to wonder why it has not been done before.

On examination, however, the reasons become apparent. In actual fact the new circuit is far more expensive to run even than incandescent lighting. To appreciate this it must be realized that tungsten ballasts in these circuits have only the life of a normal incandescent lamp, namely 1,000 hours. Consequently each fluorescent lamp, which nowadays will have a normal life around 3,500 hours, will require at least three and a half ballast replacements at 6s 4d a time. This means that the total replacement costs in a two-lamp fitting are £4 7s 2d a time and £3 18s 8d for the G.E.C. fitting as compared with only £1 14s 4d for a normal fluorescent unit.

In a life of 3,500 hours with electricity at 1d/kWh we get the following running costs per lamp :—

Lamp circuit	Watts	Lumens	Costs			d/lumen
			Lamps	kWh	Total	
Philips	113	2,155	43/7	33/–	76/7	0·427
G.E.C.	105	2,000	39/4	30/8	70/–	0·420
Tungsten	100	1,270	7/2	29/2	36/4	0·343
Fluo. q/s	54	1,320	17/2	15/9	32/11	0·287
Fluo. s/s	49	1,320	17/2	14/9	31/7	0·299

The above figures are based upon "Mellow" lamps and the conventional fluorescent circuits are quickstart (q/s) and starter switch (s/s). They show that conventional fluorescent lighting is from 13½ to 17 per cent cheaper than tungsten lamps, but the new circuits are actually 22 to 24 per cent dearer in running costs. In other words, to get the same light output from the various fittings as for the Philips lamp (4,310 lumens) for 3,500 hours we would have these comparative running costs :—

Philips	£7 13s 2d
G.E.C.	£7 12s 0d
Tungsten	£6 3s 6d
Fluo. q/s	£5 7s 8d
Fluo. s/s	£5 3s 8d

An increase of over 50s per fitting in running costs during the life of the fluorescent lamp does not seem to me to be a commercial proposition. I cannot, therefore, see that these circuits in their present form represent a useful, or even marketable, contribution to the development of fluorescent lighting.

"SIGMA."

Bactericidal U.V. Lamps

I WAS very interested in your editorial (10th October) referring to the reluctance of the American Medical Association to "accept" ultra-violet radiation from lamps as a means of disinfecting air.

I submitted this editorial to my company in America and in reply it has commented that your use of the word "reluctance" might result in conveying a rather negative impression of the value of such ultra-violet radiation for bactericidal purposes, rather

than to stimulate in the minds of your readers a greater interest in this type of radiation which will, without doubt, be recognized by the American Medical Association in due course.

As you state in your editorial, the American Medical Association has neither approved nor disapproved the system, but the mere fact that these ultra-violet radiating lamps are being used by so many hospitals in the U.S.A. in their operating rooms, wards and nurseries is an indication that this type of radiation is of beneficial use for keeping down air contamination where it is necessary to do so.

Studies have been made by some individual doctors in the U.S.A., such as Dr. Deryle Hart of Duke University, Durham, North Carolina, and I enclose an abstract of a copy of Dr. Hart's paper which may be of interest to you. In addition, the studies made on this subject by many doctors are listed in the attached compendium of published information upon airborne infection and its control.

G. Raymond Shepherd,
Regional Representative,
Westinghouse Electric
*London, S.W.*1. International Co.

Catalogue Sizes

I CAN fully agree with the remarks by Mr. H. R. Taunton in your issue of 27th October on the difficulty of filing catalogues and pamphlets of all shapes and sizes. I notice, however, that he suggests quarto and octavo and think that it may be of general interest to draw attention to BS 1311–1946 which recommends 11in by 8½in, 8½in by 5½in and 5½in by 4in, the longest measurements being from top to bottom.

Buyer.

Early Telephone History

WITH regard to "Reflector's" remarks about G. B. Shaw and his early connection with a telephone company in 1879 (*Electrical Review*, 10th November), it may interest "Reflector" and your readers to know that when telephones were introduced to this country in 1878 by the general agent for Professor Alexander Graham Bell's articulating telephone, licences were issued with them specifying what they were to be used for, even when they were required for lecturing and exhibition purposes only.

It so happened that the only licence known to be in existence was in my possession many years ago; it had been issued to a Mr. James Davis in 1878 and was No. 64. I had the pleasure of presenting this document to the Institution of Electrical Engineers for preservation and exhibition in its museum where it can be seen by those engineers who are in any way interested in early telephone history in this country.

Harry Moss, M.I.E.E., F.I.E.S.
Bradford.

Ring Circuits on D.C.

THE information emanating from the E.C.A. Technical Committee on this subject, as reported in your issue of 17th November, is interesting, but hardly surprising. Would it not have been more honest, however, to have stated the real reason for prohibition of sockets and plugs to BS 1363 on d.c. circuits as being, in my opinion, the inadequacy of the fuse to BS 1362, which from the first has been confined to use on a.c. circuits?

Surely the answer is not to deprive the consumer still connected to d.c. supplies of the advantages and economy of the ring circuit, but to use an alternative 13 A socket and fused plug which will stand up to operation on d.c. circuits. A sample in my possession is stated to have cleared a prospective current of 30,400 A at 250 V d.c.

Are we becoming so regulation and standard minded in these matters that we are unable to use our own judgment?

Folkestone. T. C. Gilbert.

ELECTRICITY IN AVIATION

THE twenty-fifth combined meeting of the Association of Supervising Electrical Engineers with the Institution of Engineers-in-Charge was held in London last week. Mr. F. Winstanley presided. Mr. F. E. Buckell (manager of the Aeronautical Department, G.E.C.), delivered a lecture in which he indicated the progress that had been made in the use of electricity in civil aviation and dealt with the part electricity had played in the development of equipment installed in aircraft and electrical services on the airfield. Water heating, lighting, cooking, ventilation and refrigerators for commercial aircraft were dealt with, as well as a number of other appliances that are provided under the heading of "comfortization." Equipment and arrangements for the lighting of approaches and runways and lights for other purposes were described and the lecture concluded with a reference to "heavy alloy," a sintered metal used for dynamic balancing on aircraft.

Productivity Conference

Discussions at the I.E.E.

At the Institution of Electrical Engineers in London last week a two-day conference was held on "Electricity as an Aid to Productivity." At the same time an exhibition was arranged in the Institution building so that those attending might get a clearer idea of the various items of equipment mentioned.

The conference was officially opened on Wednesday morning (15th November) by Sir Vincent de Ferranti who said that unless, as a nation, we modernized and electrified our industrial plants there might be unemployment in those industries which retained old-fashioned plant, through the loss of export markets. The best British industrial plants compared favourably with those in any part of the world, but many were far from the standard of the best. In these days of national economic crisis and the need to increase our exports by greater productivity, only the most up-to-date methods could be justified in view of our limited resources of manpower.

The first job, in considering how electricity could assist productivity, was to see how far we could electrify existing plant; how far we could add modern electrical auxiliaries and control; and how far we could re-align and modify manufacturing technique to obtain the full advantage of the expenditure.

Load spreading, and load shedding, had become a recognized misfortune in British industry, but all possible steps were being taken to build more power stations. The job of industry was to get the best possible value from the electricity which was available. We must not measure industrial electrification by the number of units consumed or by the maximum demand created by industry. There was much to be learned on how, without increasing maximum demand or industrial consumption, we might get still further aid from electricity.

Motive Power in the Factory

Under the chairmanship of Mr. A. N. Irens (Bristol Aeroplane Co., Ltd.), the first lecture of the conference was delivered by Mr. H. Dreghorn (B.T.H. Co.) who spoke on motive power in the factory. He began by saying that the vital necessity of greater individual productivity with a consequent increase in national production was well recognized, and pointed out that additional mechanization of industrial processes offered a valuable contribution to its realization. Competition could be successfully met only by efficient maintenance and by modern processes and equipment. Increased mechanization and new processes brought a greater application and utilization of electricity as the motive power in the factory due to its adaptability, serviceability, flexibility, simplicity and economy. Electricity was available at all times in an increasing quantity and could be transformed, converted or rectified to provide supplies to suit the requirements of any industry or factory.

The development of switchgear, motors and control gear had made available the most efficient and trouble-free driving units for all requirements. Greater efficiency and flexibility in factory layout and processes were made possible, and high productivity and economy could be achieved by the correct selection of the most suitable equipment for individual, sectional or variable speed requirements. In conclusion Mr. Dreghorn explained that the low cost and adaptability of small portable electric tools for almost universal use had a big influence on economic production in many industries.

Mr. H. G. Gubbins (Wolf Electric Tools) recommended greater use of portable tools, with overhead wiring and extension spring devices, which made for greater efficiency and safety, and reduced operator fatigue. Mr. A. T. Stretton (B.T.H. Co., Rugby) described the uses of thrustors and their value in eliminating waste motions, simplifying control, reducing machine maintenance and scrap and increasing operation speed. Mr. Hilton (Urwick, Orr & Partners) deplored the unfortunate tendency to abuse electrical equipment. He also put in a plea for standardization, as did Mr. B. L. Metcalf (National Coal Board).

Mr. R. W. Ritchie (Sanderson Bros. & Newbold Steelworks, Sheffield) emphasized

the importance of using motors of the proper economic rating; the choice of motor was as much a factor in productivity as its proper use.

Industrial Heating Processes

The chairman for the afternoon session was Sir Harry Railing, and industrial heating processes were dealt with by Mr. O. W. Humphreys (G.E.C.). His lecture took the form of a commentary to an excellently produced film which had been prepared by his company. He showed that until recently most industrial heating processes had been so lengthy that it was impossible to fit them into the production line. Treated parts had to be prepared in advance of assembling involving much handling which might otherwise have been avoided. Co-operation between the electrical and other industries, however, had now produced such an acceleration of heating processes that the position for many industries had been revolutionized; time, labour and space could be saved, with beneficial results not only on productivity but also on the quality of the finished product. It was shown that in other industries, where the full advantages of line production might not be attainable, electric process heating with its speed, precision and repeatability had much to offer.

The film began with a review of heating processes with special reference to new techniques, indicating broadly the purpose to which each was best suited, and continued with an examination of the application of these processes in various industries including those concerned with metallurgical processes, potteries, wood-working, plastics and surface finishing.

Mr. N. Wilson (Josiah Wedgwood) described the use of the electrical tunnel kiln in the pottery business. Its advantages included absence of products of combustion and ease of temperature control.

Mr. E. Reisner dealt with the applications of electricity in increasing productivity in a modern plywood plant, and Mr. Robiette (John Mills & Partners) described some of its metallurgical applications. Mr. C. T. Melling (Eastern Electricity Board) expressed the view that the high-frequency furnace could be used effectively to save time and cost. Dr. Ivor Jenkins said that it had more or less replaced the crucible process for certain steels, but was not adapted to refining on a large scale. It would never have the wide application of the arc furnace because it entailed the use of relatively pure raw materials.

In reply to Mr. A. N. Irens (Bristol Aeroplane Co.), who inquired about paint spraying, Mr. L. J. C. Connell (G.E.C.) described the electrostatic process of paint spraying and said that output would be increased by using the right materials with radiant heat, allied with mechanical handling, so that sprayed parts could be sent along a conveyor line without risk of damage.

Welding Applications

When Col. B. H. Leeson (director, B.E.A.M.A.) took the chair in the evening Mr. H. West (Metropolitan-Vickers) discussed welding applications. He said that the application of electric welding to the fabrication of metal parts and structures had received great impetus from two world wars. The best results could be achieved only when the design of the parts concerned made use of the features peculiar to electric welding.

Arc welding, particularly of mild steel, was now indispensable in the manufacture of many industrial products. The limits of speed and output had been reached in hand welding and it seemed reasonable to look for an extension of automatic methods using both submerged arc and oil-coated electrodes. The extended application of automatic and multi-head machines together with multiple loading arrangements could increase output enormously.

Referring to "design for welding" Mr. West said that the use of metal the thickness of which was determined solely by the stresses experienced rather than by the process, as in casting, made possible a great saving in weight. Furthermore, the use of manipulators and positioners, which increased the amount of downhand welding, greatly sped the welding process. Mr. West concluded by remarking that the increased use of stud welding would eliminate a good deal of drilling and tapping when the possible saving was fully appreciated.

Mr. H. B. Ferguson (G. A. Harvey & Co.) reviewed the position with regard to the molecular joining of vessels together and stressed its dependence on electricity.

Mr. J. Wright (Metropolitan-Vickers) said one of the economic advantages of spot welding was that it permitted of a continuous manufacturing process by the joining up of separate lengths of material. The use of one of the resistance processes, with their short welding times, could increase output

considerably. Mr. S. Carpenter (M-V) said welding processes were of great advantage but they depended on proper planning. Mr. C. E. Slade (Philips Electrical) illustrated the use of spot welding in the motor car industry to increase output.

Dr. B. E. Noltinek (Mullard Electronic Products) drew attention to recent developments which made possible the soldering of non-ferrous metals, such as aluminium, by the use of ultrasonics.

Major J. Caldwell reviewed the developments in welding since he read a paper at the Institution 30 years ago and said that new developments in industries such as shipbuilding should not be held up by a conservative or nervous attitude towards them.

Mr. Scott (Crompton Parkinson) emphasized the saving and increased productivity which could be achieved by spot welding and referred to its use on ships.

Handling and Inspection of Materials

The morning session of the Conference on 16th November (chairman, Dr. P. Dunsheath) was devoted to a discussion on the handling and inspection of materials. Mr. H. S. Carnegie, who was to have given a paper on this subject, was in the United States, and his place was taken at short notice by Mr. G. V. Sadler (Vaughan Crane Co.) and Mr. C. F. Brockelsby (Marconi Instruments, Ltd.).

It was emphasized that the movement of material should be reduced to the minimum. This could be done in designing factory layout. Existing plant, however, could be improved to allow mechanical handling to reduce the loss of time between processes.

Various types of equipment for handling material in factories were mentioned during the lecture and electric drives and controls for conveyors discussed; the economic advantages of electric fork-lift trucks were also considered. For maximum efficiency fixed station lifts and hoists, travelling cranes and monorails should be electrically driven and the controls arranged to allow maximum effective use to be made of the driver's time.

Energy- and time-saving devices in factories such as thrustors, actuators, electric and electronic aids for thickness and moisture measurement, flaw detection, surface finishing, etc., were described and some of them demonstrated.

Mr. W. Watson (Herbert Morris, Ltd., Loughborough) emphasized the need for careful selection of equipment used to suit the work. This not only increased safety but introduced orderliness into the manufacturing process and increased the output from a given floor area.

Mr. G. R. P. Arnot (Lansing-Bagnall) referred to the saving in space obtainable with power-operated as compared with hand trucks, which might be very considerable in the case of a large factory. He also outlined some of the problems involved in their design.

Mr. E. G. Taylor (G.E.C.), a member of the Productivity Team on Materials Handling which visited America, outlined some of the principal findings of the team and emphasized its conclusion that the problem of productivity was to a great extent a problem of spreading "know-how" and technique.

Mr. F. T. Dean (Geo. W. King) said the greater productivity in America was due more to better material handling than anything and that all the equipment was obtainable here.

Mr. G. D. Lewis (Standard Telephones) pointed out that proper attention to the type and layout of buildings, plant and gangways could often obviate a great deal of material handling. The first step should be to see whether the need for moving goods could be removed.

Mr. D. J. Watkins said much could be done by co-operation within industry in respect of material handling. He was connected with the manufacture of motor car components, and they were co-operating with the motor car manufacturers in palletization from the end of their assembly tracks to the motor car assembly.

Lighting, Heating and Ventilation

The final session of the conference was held in the afternoon when, with Mr. C. T. Melling in the chair, Mr. R. O. Ackerley dealt with the effects of lighting, heating and ventilation on industrial productivity. He said that irrespective of factory equipment and production methods, maximum productivity could not be achieved unless every worker was kept personally efficient; every step was taken to reduce accidents and absenteeism and to maintain health; and effective control could be exercised whenever and wherever it was needed. Well-designed ancillary services made a major contribution to these ends. Good lighting, for example, enabled a worker to reach a higher standard of personal efficiency, to work faster, more accurately and with less fatigue than was possible with bad lighting. Electric heating,

air conditioning and ventilation, equipment for cleaning, and devices for rapid communication and many other purposes could make an effective contribution to greater productivity.

Mr. Irens said that management was often concerned almost solely with capital cost, but in most industries a 1 per cent improvement in output, which might result from better lighting, would more than cover its cost. There was a case for electric heating in factories under certain conditions, particularly where in summer a large boiler house had otherwise to be kept in operation when the load was negligible. In one big commercial building it was found that the heat losses in the pipes supplying the lavatories with hot water were sufficient to cover the extra cost of providing electric heating by thermal storage.

Mr. Williams mentioned that a field which had not been developed very much in this country was the provision of a certain amount of heating within the maximum demand of a factory. If automatic control was employed, the difference between the factory's actual demand and maximum demand could often be used for some kind of storage heating.

Mr. J. I. Bernard (E.D.A.), on the question of off-peak electric space-heating, said that a method of particular interest for small factories was to bury heating wires in a solid concrete floor. The concrete provided a certain store of warmth which could be drawn on if the current was cut off over the peak. That provided the " warm feet and cold head " conditions which were recognized as the ideal to aim at.

Mr. G. V. Sadler (Vaughan Crane Co.) said that they themselves used what was one of the largest applications of electric space-heating in Manchester. The area of their building was about 95,000 sq ft, and there were eighty 20 kW heaters. There was no other heating in the factory. The office block was heated by a 100 kW electrode boiler and a 150 kW fan heater, which was only used in very cold weather. Even in winter there were days when the ambient temperature was fairly high and when he found on going through the factory that not a single heater was turned on. In cold weather it might be alarming to see how the meters went round, but on the whole the cost of heating the factory in that way was comparable to that of any other form of heating, and electric heating had a definite bearing on productivity, since comfort made for better work. In many cases where steam heating was used in factories the temperature was too high on warm days, which was worse from the productivity point of view than having it too cold.

Mr. Ackerley, replying to questions, said that it did not matter what light source was used, whether fluorescent or tungsten, provided it was used in the right way. From the point of view of getting a great deal of light with a very small dissipation of heat, however, fluorescent lighting had an advantage over tungsten.

Mr. E. B. Sawyer (Lighting Service Bureau) said that increased illumination almost invariably resulted in increased productivity, so that as a rule the installation of fluorescent lighting would increase production. The daylight type of fluorescent lamp had high efficiency and suitable colour rendering for industrial purposes.

Mr. B. C. Hilton referred to the use of unit heaters as draught killers. In the despatch section of a factory, where the doors had to be wide open, it was not possible, he said, to avoid draughts, but it was possible to kill them quite effectively by blanketing them with unit heaters.

Mr. R. W. Ames suggested that the higher cost of fluorescent lighting as compared with tungsten meant that it would take five or seven years to counterbalance the extra capital cost. Very few fluorescent fittings suitable for factories were vitreous enamelled ; most of them were stove enamelled and in five or six years would probably require to be complete re-stoved. Those costs must be taken into account.

Mr. Ackerley, on the question of the cost of lighting, emphasized that lighting must be regarded not as an unfortunate overhead cost but as a production tool.

Purpose of Conference

In conclusion, the proceedings were summed up by Mr. C. T. Melling, who said that the conference was regarded by the Committee as one with a " trigger action." It had provided sufficient material to enable those who met the industrialists in the smaller and more backward factories to go out and get them to adopt the better techniques.

We could not have wholesale scrapping of plant which was still capable of production, but without scrapping it we could improve it with electrical drive, accessories and control, and the backward industrialist could be helped to realize how it could be done.

Power in New Zealand

Survey of a Pressing Problem

At the present rate of increasing demand the hydro-electric resources of the North Island of New Zealand will be fully utilized within ten years. Where, then, is more electricity to come from after that?

An endeavour to answer that question was made by Mr. M. G. Latta, chief electrical engineer, State Hydro-electric Department, when he addressed the annual conference of the Electric Power Boards and Supply Authorities Association at Christchurch, New Zealand.

To generate the 25,000 million kWh which it was estimated would be required (above hydro-electric output) in the first ten years after full exploitation of lake and river resources would require 1·6 million tons of coal, the yearly demand rising to 3·5 million tons and more. The rate of production had varied from 2 to 2·8 million tons a year and as in recent years it had been insufficient, coal had been imported from the United States, Great Britain, South Africa and India at high cost.

Limited Resources

The coal resources of New Zealand were not sufficient for large-scale generation in any long-range plan, Mr. Latta stated; that limited and irreplaceable national asset should be conserved, if at all possible. Of the "proved recoverable" 300 million tons and the "probably recoverable" 537 million tons, only one-sixth was in the North Island.

Coal for the King's Wharf power station, Auckland, cost 48s a ton in 1948–49; since the removal of subsidies it had cost approximately 82s a ton at King's Wharf and approximately 100s a ton at Evans Bay station, Wellington. Mr. Latta contended that with stations built at or near the Waikato or Taranaki fields and the use of open-cast methods, 50s could be regarded as the probable average cost a ton.

To generate 25,000 million kWh eight million tons of fuel oil would be needed for the ten years; consumption rising to 1,750,000 tons a year and more. It would be extremely unwise to adopt a system of power generation which would almost certainly be "subject to heavy restrictions in time of war" and it appeared unlikely that the price level would be much less than £8 a ton.

Potential energy in the form of geothermal heat was available, but whether it would be practicable to use it economically for power generation one could not say before a great deal of investigation work had been carried out. Some form of heat exchanger would probably be required and the cost of wells, piping, etc., would be appreciable. The turbines would be of a special design and large compared with standard turbines because of low steam pressures and corrosion difficulties. Generators and other equipment would probably require special protection against corrosion. It was reasonable to assume that the capital cost of a geothermal steam station would be of the same order as that of an ordinary steam station.

Comparative Costs

Mr. Latta estimated the cost/kWh generated by various means to be: hydro, 0·24d; coal, 0·7d to 0·9d; oil, 1d to 1·2d; geothermal steam, 0·5d to 0·6d.

For the amount involved the total cost of delivering power to the North Island from the South Island would compare more than favourably with the cost of producing power by steam stations using coal or oil. To transmit 1,000,000 kW a distance of, say, 350 miles up the South Island and across Cook Strait, through the Haywards substation, would justify transmission at about 400 kV (present long-distance transmission voltage is 110 kV with new 220 kV lines being built). Power would perhaps be converted from a.c. to d.c. for transmission across Cook Strait, then reconverted to a.c. for the North Island distribution system.

Cook Strait was a serious obstacle, but even with the present high voltage power cables it was not insurmountable and present difficulties might be greatly reduced by expected developments.

Arrangements had already been made for preliminary survey information to be obtained by H.M.N.Z.S. *Lachlan*, a survey ship lent to New Zealand by Australia.

If the technical difficulties could be solved a very high cost could be economically justified and still enable hydro-electric power to be supplied from the South Island to the North Island at a cost per kWh comparable with, or lower than, by alternative methods of production.

Investigation might show that a tunnel under Cook Strait would be more economic than laying a series of cables, or dependence on steam stations in the North Island consuming coal or oil which would cost some tens of millions of pounds in a decade.

There had been a proposal to divert some of the North Island's demand to the south by charging a much higher rate for additional power requirements in the North Island, or by Government direction that new industries must go south, but in Mr. Latta's opinion such methods could have only a minor effect at the most.

Under a democratic government any possibility of attempting to change the population trend was very remote. From the point of view of planning the future supply it must be assumed that the demand for power in the North Island would continue to increase rapidly.

Installations in Chemical Factories

Consideration of Special Problems

WHEN an electrical installation is designed for a large chemical factory four major factors have to be considered. The floor area of the factory is often very large and there may be many widely separated buildings, the processes are continuous and there are long runs between stoppages, the heavy power demand has a high load factor and there are likely to be frequent additions and alterations to both buildings and electrical systems.

The problems involved in designing installations for such service are discussed in detail in a paper which was read in London last week by Mr. D. B. Hogg (I.C.I.) at a Utilization Section meeting of the Institution of Electrical Engineers. The author confines his remarks to electrical installations for a.c. in chemical factories and excludes consideration of the equipment used in chemical reactions, such as electrolysis, and the provision of power, whether from a private generating plant or the public supply. In this connection, however, he points out that although the design of a private power station is largely dependent on the steam requirements and size of a particular factory and the provision of a public supply is related to the area network, in neither case is the design influenced to any great extent by the corrosive and explosive conditions which so greatly affect the electrical installation.

It is shown that a high-voltage distribution system is required and that the methods and materials of good practice in the supply industry are in general suitable, but in the author's experience it is inadvisable to " tailor " an installation too closely to a body which is likely to have grown before the " suit " is very much worn.

Detailed consideration is given to the wiring and electrical equipment of factories having good clean conditions and it is claimed that in the majority of cases motors can be of the squirrel-cage pattern, direct-on-line started, and that contactor-type air-break starters are preferable for their control. With reference to corrosive and explosive hazards, as much of the electrical equipment as is practicable is installed outside the danger zone while the remainder is specially chosen for operation under these conditions.

A brief note is included on the effect of static charges on inflammable substances and inert powders and reference is made to some of the methods employed to prevent the accumulation of such dangerous charges. In conclusion the author discusses the standardization of equipment and layout which has been practised for many years and expresses the opinion that the saving in time, effort and material has more than justified the use of apparatus or methods not always the latest or exact match for the duty.

Commercial Travellers' Dinner

The annual dinner and smoking concert of the Electrical Commercial Travellers' Association is being held on 7th December (6 for 6.30 p.m.) at the Windsor Castle Hotel, Victoria, S.W.1. Tickets (15s each) can be obtained from Mr. H. Bowen, 69, Warwick Gardens, London, W.14.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Ultra-Modern Kettle

A FAST boiling kettle of modern design has been produced by the SIMPLEX ELECTRIC CO., LTD., Broadwell, Oldbury, Birmingham. The heat-insulated handle is of shock resisting plastic and shaped so that the kettle may be filled from the front or either side. It is positioned to keep the hand clear of steam when the lid is removed and is set at an angle to avoid wrist fatigue when pouring. Vents in the lid knob direct steam towards the spout and the lid locks under the handle. Another feature is that the connector fits inside the handle assembly and only protrudes slightly.

The kettle has a 1,500 W loading with an element of the tubular sheathed immersion type and will boil 4 pints of water in nine minutes. If it is allowed to boil dry or is switched on when empty, a switch on the element head automatically disconnects the element from the supply. The cut-out can be re-set by removing the connector and pressing the re-setting plate.

The body of the kettle is of heavy gauge copper, finished in polished chromium plate, and has an electro-tinned interior with a spout designed to give smooth pouring. It is supported by three plastic feet to prevent scratching or marking of polished table tops. It complies fully with B.S.S. 1671/1950, and the price is £3 10s.

Alkaline Accumulators

To augment its existing range of all-steel alkaline accumulators for railway signalling applications, NIFE BATTERIES, LTD., Redditch, Worcs, has introduced a new cell in a glass container. Available in a range of capacities from 10 Ah to 50 Ah at a nominal voltage of 1.25 V per cell, these new cells have exactly the same electrical characteristics as the all-steel series, while the increased container size allows a greater bulk of electrolyte which for certain applications offers considerable advantages.

Portable Fire

The " Solectra 253 " portable fire made by BRATT COLBRAN, LTD., 10, Mortimer Street, London, W.1, is fitted with two of the latest close-wound 1 kW bar elements and is controlled by a single switch. The front, including the reflectors, is a one-piece pressing of heavily chromium plated brass, with the back box and feet finished in black crackle. The carrying handle is non-metallic and the back supporting leg is adjustable to vary the angle of the fire. A heavy gauge chromium plated guard is fitted. The price is £4 5s (plus purchase tax £3 2s 6d in this country).

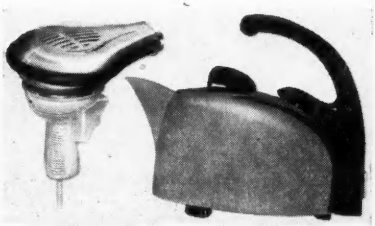
Hair Dryer for Saloon Use

The " Permaster " hair dryer made by the BESTFREND ELECTRICAL CO., LTD., Banstead, for saloon use has a heavily chromium plated and polished copper body and an ivory bakelite handle specially designed to resist hard wear, a " buffer " strip round the body protecting the metal cover from damage due to dropping or careless handling.

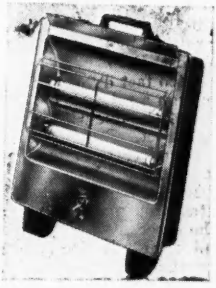
Plastic insulation of coils is designed to give the motor long life in the severest conditions and there is no radio interference. A finger switch with " hot," " cold " and " off " positions

Nife alkaline cell in glass container

Below (Left): Bestfrend " Permaster " hair dryer (Right): " Creda " kettle



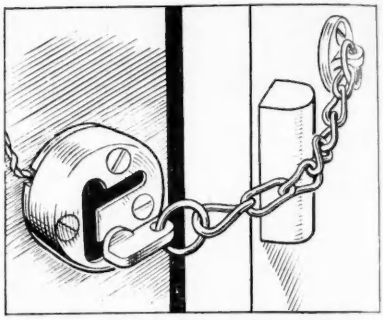
" Solectra 253 " portable fire



can be fitted either at the front or rear of the handle. The weight is 2lb 4oz and the loading 450 W. Where lightness is of first importance, the machine can also be supplied in aluminium, the weight being approximately ½lb less. The copper model costs £3 19s 6d (plus 19s 10d P.T. in this country). The price of the aluminium type has not yet been fixed.

Door Chain Switch

A simple and inexpensive burglar alarm, known as the " Electric Bobby," which has just been made available by the JEARY ELECTRICAL CO., LTD., 5, Lamb's Buildings, Bunhill Row, London, E.C.1, gives warning in advance of actual entry by the door to which it is fixed. The use of skeleton or duplicate keys makes no difference. This device is in the form of a door chain which, in the day position, allows the door to be opened sufficiently to identify callers. With the chain in the night position the slightest movement of the door causes it to operate a switch, which can be associated with a bell, and even if the door is pulled to again the switch remains on. The price is 12s 6d.

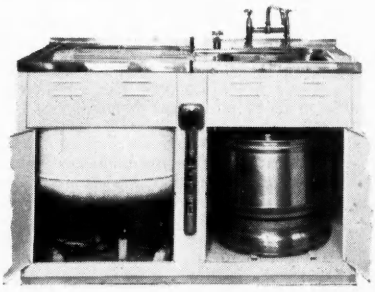


The " Electric Bobby " door chain switch

Sink Unit

A sink unit comprising a full-size 8lb capacity " Automagic " combined clothes and dish washing machine built into a cabinet 54in wide by 26in deep by 36in high plus a 1¼in splashback is now available from THOR APPLIANCES, LTD., 55-57, Oxford Street, London, W.1.

The single sink bowl and draining board are manufactured in stainless steel, and the cabinet is of stout gauge aluminium stove enamelled in cream or white with attractive plastic handles. Hinged doors provide access to the mechanism built-in under the draining board and to storage space beneath the sink bowl where the clothes tub or dish washing attachment is kept when not in use. The price of the complete unit is £141 5s (plus P.T. in this country) : with clothes washer only it is £125 10s (plus P.T.) and with dish washer only £128 (plus P.T.).



Above: Thor "Automagic" sink unit

Carpet Dyeing Apparatus

Under an *in situ* carpet dyeing process developed by R. G. DIXON & CO., LTD., Capitol Works, Empire Way, Wembley, specially selected fast dyes are fed at near boiling point through a rotating brush into the surface and root of the pile without saturating the back of the carpet. Besides the considerable saving in time and cost, the new method is claimed to be a great advantage over traditional vat-dyeing, which saturates the back of the carpet, often causing shrinkage and loss of shape. The process, which is equally suitable for low and high pile jute, cotton, wool or mohair carpets, can also be employed to apply different coloured borders or patterns.

Dixon carpet dyeing apparatus

Commerce and Industry

Engineering Wages Proposals

London Theatre Lighting

THE National Arbitration Tribunal, to which the dispute on wages in the engineering industry was referred, has decided not to issue an award on the subject. Instead it has made suggestions to both parties to the dispute as a basis for further negotiations.

It is proposed that the employers' offer of minimum rates of 100s (an increase of 8s) for unskilled and 118s (an increase of 11s) for skilled workers shall stand, but that increases shall also be given to those who are now receiving more than the minimum rates. Unskilled workers whose earnings do not exceed 98s a week should receive 8s a week more and those earning between 98s and 106s should be brought up to the 106s level. The full 11s increase should be paid to all skilled workers earning up to 117s 2d and those receiving wages between this figure and 128s 2d should be raised to 128s 2d. It is said that by this method fewer workers will fail to get increases than under the employers' offer.

Proportional increases would be made in the wages of semi-skilled workers but individual "merit" rates and pieceworkers' rates would not be affected.

Contract Price Adjustment Formulæ

The latest figures for use in the B.E.A.M.A. contract price adjustment formulæ are as follows: "Rates of Pay": the rate of pay for adult males at 11th November shall be deemed to be 115s (unchanged). "Costs of Material": the latest figure for intermediate products published by the Board of Trade (11th November) is 317·1, and is the figure for October (against 308·0 for September).

National Packaging Exhibition

Mr. Harold Wilson, President of the Board of Trade, will open the Second National Packaging Exhibition which will take place at Olympia, London, from 30th January to 9th February next. The decision of the organizers, Provincial Exhibitions, Ltd., to bring the exhibition to London, following the successful initiation of the venture in Manchester last year, has been justified. There will be more than 150 exhibitors at this second exhibition. Among recent additions to the list of exhibitors is the Dollar Exports Board, who join the Special Group of Official and Trade Organizations comprising the Board of Trade, the British Standards Institution, the Institute of Packaging, the Railway Executive, and P.A.T.R.A.

The programme of four papers arranged by the Institute of Packaging is as follows:—"Transport in Relation to Packaging," by T. E. Jackson; "Packaging for Multiple Stores," by Jan Gerke; "Packaging for Export," by Roger S. Falk; "Any Questions" session with the specialist team on packaging which recently visited the United States under the auspices of the Anglo-American Council on Productivity.

Fluorescent and neon display lighting at the Empire Theatre, Leicester Square

Empire Theatre Lighting

A transformation in the appearance of the frontage of the Empire Theatre, Leicester Square, London, both by day and night, has been effected by the installation of a display designed, manufactured and erected by Claude-General Neon Lights, Ltd. At each side of the building, two semi-circular columns of fluted glass, 50ft high, each enclose ten lines of fluorescent tubing and five of neon red. A horizontal member of similar construction intersects the verticals near the top of the facade. Red, green and blue tubing, with independent switching for each colour, is used in this portion of the

display. The word "Empire" at the top of the building is in letters 6ft high, illuminated by tubing of three colours, independently controlled. No fewer than forty-nine different colour combinations can be obtained at will on the whole installation. Above the canopy is an interchangeable programme sign with an opal glass backing illuminated by white tubing. Against this evenly lit background, the lettering appears in silhouette. The display is completed by two signs on the wall of the building facing Coventry Street, and an installation of white tubing under the canopy which provides brilliant illumination on the pavement. A subsidiary programme sign is incorporated with the canopy vallance. Nearly one mile of tubing, operated by 150 transformers, is embodied in the display.

"Xcel" Cookery Book

A new edition of its Cookery Book has been produced by Elexcel, Ltd., Victor Works, Broad Green, Liverpool, 14. This is an excellent collection of recipes, covering the whole range of the cooking art, and many useful household hints are included. There are also a number of illustrations. The book is presented gratis to purchasers of "Xcel" cookers; to others a charge of 3s 6d is made.

F.B.I. Register

The "F.B.I. Register of British Manufacturers" for 1950–51 is now available from the publishers Kelly's Directories, Ltd., and Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1 (852 pp.; price 42s.). This directory, designed to promote British export trade, is distributed to importers, buyers, Trade Commissioners, Chambers of Commerce, etc., all over the world.

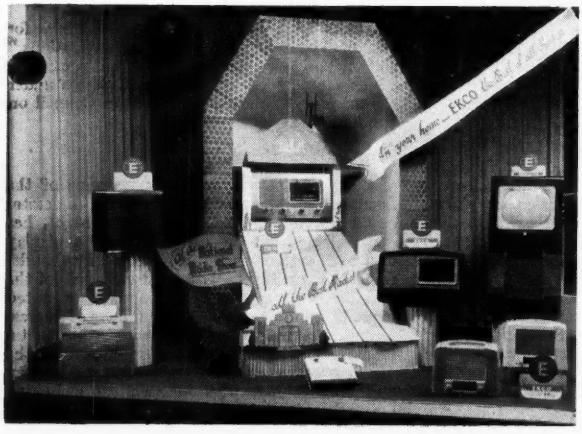
It is the only authorized directory of the Federation of British Industries and it gives a great deal of information about more than 6,000 members and their products, thus forming a comprehensive guide to a great variety of British manufacturers. To assist reference major instructions and cross-references are given in English, French and Spanish. Among the useful information included are trade names and trade marks, and particulars of trade associations.

Railway Supervisory Control

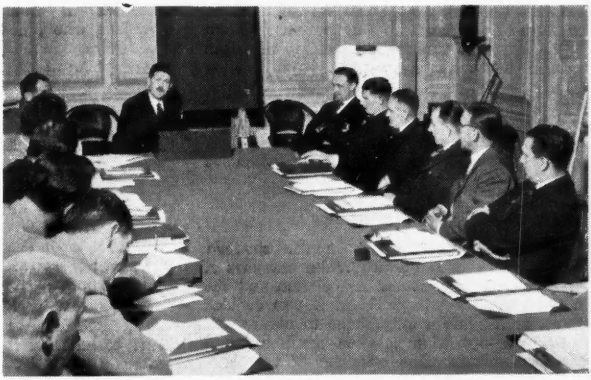
In connection with the electrification of their Eastern Line, the Victorian Railways have ordered a large supervisory control system from the General Electric Co., Ltd. The system will enable switchgear at thirty substations to be controlled and indicated from a power operation room at Moe. Six pairs of pilot wires will each connect several substations to control, making the system a complex tandem scheme, and telephone and telemetering facilities will be incorporated. Certain tie substations will have initially as few as three points requiring supervisory control. These substations will be controlled by a relayed supervisory control system to obviate the necessity for installing in them complete station equipment. At a later stage in the electrification programme complete equipments will be installed at all tie substations; these subsequent modifications will be catered for at Moe by simple cross jumpering on the G.E.C. supervisory apparatus.

Window Display Competition

The innovation of arranging for dealers to have the co-operation of art school students if they wished in dressing their windows for the annual competition arranged by E. K. Cole, Ltd., was amply justified by the results which are now announced. Winners of the dealers' prizes were :—First (£100): Weston Hart, Portsmouth. Second (£50): Methven Simpson, Ltd., Dundee. Third (£20): Gentry & Bayley, Ltd., Gillingham, Kent. Two runners-up (£10 each): Mr. J. W. Gray, Scarborough and Messrs. A. F. Coyne, Newark, Notts. Students' prizes were awarded as follows :—First (£20): Mr. C. A. V. Nicholls (Southern College



Prizewinning Ekco window display of Weston Hart, Portsmouth



A discussion during the S.E. Scotland Electricity Board's training course for its commercial staff

of Art, Portsmouth). Second (£10): Mr. R. Bonella Hirst (Dundee College of Art). Third (£5): Messrs. R. May and L. C. Davis (Medway College of Art, Rochester). Two runners-up (£2 10s each): Miss P. Harben (Coventry Art School) and five students of Leicester Art School. The judges were the editors of the *Wireless & Electrical Trader*, *Electrical & Radio Trading*, the *Music Trades Review* and the *Pianomaker*, with Mr. W. Coates, Mr. R. Day and Mr. E. K. Cole, Ekco chairman and managing director.

Metrovick Set for Canada

The Nova Scotia Light & Power Co. has placed an order with the Metropolitan-Vickers Electrical Co., Ltd., for a 20 MW 3,600 r.p.m. turbo-generator set with condenser and feed water heaters. It will be installed in the company's Halifax station, and will be one of the largest generating sets in the Maritime Provinces.

The turbine will be a single cylinder machine designed for initial steam conditions of 600 lb/sq in, 800 deg F. The condenser is designed to give a vacuum of 28·75 in Hg, and four-stage feed heating will give a final feed temperature of 340 deg F—both at the economic load of 16 MW. The generator will be a three-phase 60 c/s air-cooled direct driven machine.

Birmingham Electric Club

The Birmingham Electric Club's children's party is to be held on 6th January at the Grand Hotel, Birmingham. The price of tickets for children is 5s each, and for adults 10s. Applications should be received by 14th December.

Scottish Board's Training Course

The South East Scotland Electricity Board has just completed a five-day training course for all commercial staff in charge of local districts and service centres. The objects were to provide some training in new applications of electricity and developments in appliances, and also to afford the staff an opportunity to discuss how to give the best service to the public. Models, films and lantern slides were used to illustrate several of the talks. The success of the course was due in no small measure to the co-operation of manufacturers who were invited to take part, the Agricultural Electrification Advisory Section of the British Electricity Authority, the Electrical Development Association, and the Electric Lamp Manufacturers' Association.

"Nife" Handlamp

It is announced that the "Nife" high candle-power handlamp Type N20 (not headlamp as stated in the *Electrical Review*, 27th October, page 660) has been fully approved for use in inflammable atmospheres containing petroleum spirit.

New N.Z. Non-Ferrous Metal Works

McKechnie Brothers, Ltd., Birmingham, 16, are forming a company in New Zealand under the title of McKechnie Brothers (N.Z.), Ltd., with a capital of £200,000 for the production of extruded brass, bronze, whitemetal and copper rods and sections, chill cast phosphor bronze bars, hot brass and bronze stampings, anti-friction metal and other non-ferrous metal ingots. A plot of land in New Plymouth for the new works and part of the plant have already been purchased; plans are being prepared, and building operations should commence early in 1951. The new company should be in production in about twelve months.

Film on Laminated Wood

Some of the many uses of "Permali" laminated impregnated "densified" wood are shown in a film exhibited in London last week by the New Insulation Co., Ltd., Gloucester. The first part of the film deals with the production of the material and then there are "shots" of a number of factories (mainly electrical), Cliff Quay power station, a colliery, the Droitwich station of the B.B.C., a textile mill, etc. Among

the uses thus illustrated are applications to generators (including slip ring covers and end bells), switchgear, inductance coils, television dipole aerial systems, insulating fishplates on railways, coal screening and weaving. After the showing of the film (which was produced by Mr. Edward Cook's "Big Six" Film Unit) appreciation was expressed by Maj.-Gen. K. C. Appleyard, president of the Institution of Production Engineers.

Board and Contractors

At a meeting held last month between representatives of the South Wales branches of the Electrical Contractors' Association and the South Wales Electricity Board it was decided to set up a Liaison Committee to secure and maintain co-operation between the Board and E.C.A. members. One outcome of this is a conference arranged for Wednesday next, 29th November, at which papers will be presented and discussed. The event will conclude with an informal dinner at the Royal Hotel, Cardiff. It is expected that Mr. P. G. Wallis, president of the E.C.A., will attend the gathering.

Works Visit

Members of the Syrian Legation, Mr. Omari and Mr. Atassi, were conducted on a tour of the factory of the Wandleside Cable Works, Ltd., on 13th November by Mr. W. L. Wray, director, and Mr. G. W. Edge, production manager.

Trade Announcements

The **Telegraph Construction & Maintenance Co., Ltd.**, has appointed Mr. J. H. Barham, Associate I.E.E., as Midlands representative covering the areas of the Midlands and South Wales Electricity Boards, and Mr. F. J. Walker has been appointed East Midlands representative covering the area of the East Midlands Electricity Board and the Norfolk, Suffolk and Fens Sub-Areas of the Eastern Electricity Board.

Mr. G. B. Richings has been appointed a representative of the **Sloan Electrical Co., Ltd.**, in the Somerset and Devon area, and will operate from the Exeter branch. Mr. Richings served his apprenticeship with the Western Electrical Co., Bristol, and was later with the Wessex Electricity Co.

The geared and ordinary motors of the **Normand Electrical Co., Ltd.**, have now been approved by the Canadian Standards Association.

The **Egen Electric Co., Ltd.**, is moving to new premises on 1st December at Charfield Industrial Estate, Canvey Island, Essex.

Mr. D. Whynes has been appointed as an additional sales representative attached to the London office of **Santon, Ltd.** Mr. R. L. Moss has also been appointed as sales representative in London to replace Mr. S. Dvorjetz, who is now manager of the Birmingham office. Mr. F. G. Robinson, formerly Birmingham manager, is to be responsible for the development of industrial sales at the head office.

Catalogues and Lists

Automatic Telephone & Electric Co., Ltd., Strowger Works, Liverpool, 7.—Illustrated brochure outlining the company's industrial resources and commercial activities. Also a folder on the sound system in the Queen Elizabeth Hospital, Birmingham, and another on loud-speaking telephone systems.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, 17.—Nine technical folders on vertical induction motors (up to 1,000 h.p.); crane protective panels; pressure control devices; electronic position control equipment; oil and water flow alarms for transformer cooling systems; dewirement indicator for trolleybus service; d.c. stabilized power unit; resistance seam welding machines, type A.S.M.; welding electrodes.

Omega Lampworks, Ltd., Rodney Place, Merton Abbey, London, S.W.19.— Priced folder on "Omega" lamps of all types.

Carron Company, Carron, Falkirk.—Price list and illustrated folder on the Carron "H" series of electric cookers.

Simplex Electric Co., Ltd., Broadwell, Oldbury, Birmingham.—Illustrated brochure on "Creda" water heating equipment.

Heatrae, Ltd., Heatrae Works, Norwich. —Illustrated folder on electric water heaters.

Pye, Ltd., Radio Works, Cambridge.—Illustrated brochure telling the story of the company and the part it is playing in the development of television.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £120 0s 0d
COPPER, H.C. Electro	ton £202 0s 0d
Fire Refined 99·7 per cent	ton £201 0s 0d
Fire Refined 99·2 per cent	ton £200 10s 0d
LEAD, English	ton £137 0s 0d
MERCURY	flask £31 15s 0d
TIN	ton £1,040 0s 0d
ZINC, G.O.B. Foreign	ton £151 0s 0d
Electrolytic	ton £155 0s 0d
BRASS Tubes	lb 1s 9¾d
Sheet	lb 2s 0.d
Wire	lb 2s 3d
COPPER Tubes	lb 1s 11¼d
Sheet	ton £247 0s 0d
H.C. wire and strip	ton £226 10s 0d
PHOSPHOR BRONZE	
Wire	lb 3s 1¾d
RUBBER, No. 1 R.S.S. spot	lb 61½d–62½d

PARLIAMENTARY NEWS

From Our Special Reporter

IN the House of Commons last week Mr. H. L. D'A. Hopkinson asked the Minister of Fuel and Power whether in the case of isolated farms where the financial cost of supplying electricity by the grid system was prohibitive, he would make a statement about the directions which he proposed to give to the British Electricity Authority, with a view to encouraging the Area Boards to supply and operate modern diesel plants covering small inhabited localities.

Mr. Noel-Baker said it was the duty of the British Electricity Authority and Boards to decide what was the best method of supplying electricity to any particular consumer. He could not, therefore, issue any general directions of the kind proposed. But if the hon. member had any suggestions to make about some special place or district, he was sure that the Area Board concerned would be glad to consider it.

Mr. Heathcoat Amory asked if the Minister would bear in mind that if Area Boards were further encouraged to consider this alternative, it would bring hope to a good many areas which had very little hope of getting electrical supplies in the near future in the ordinary way.

Mr. Noel-Baker replied that he was afraid that in the present state of capital investment it would be difficult to deal with the remote areas. This year he hoped rural development would be getting on for double what it was in 1938.

Severance Compensation Regulations

Mr. Selwyn Lloyd moved the annulment of the Electricity (Severance Compensation) Regulations, 1950, and similar regulations affecting gas undertakings. He said the Regulations affected 350 local authorities who formerly owned electricity undertakings and 276 who ran gas undertakings. The Electricity Act provided for a sum of £5 million to be paid as compensation for the severance of these electricity undertakings from the other activities of the local authorities, and he complained that in the allocation of this sum the smaller authorities were not being sufficiently recompensed, suffering by contrast with the larger authorities. In the case of gas undertakings there was the same discrimination. Fresh regulations should be made in order to put the matter on a more just and equitable basis.

Mr. J. H. Hare, seconding the motion, said that the order in relation to electricity undertakings was definitely unfair. The Minister's refusal to adopt the sliding scale principle was at the root of the matter.

Mr. Aitken said that it was unfair and unjust that these terms of compensation were such that there were permanent increases in the rates of small communities.

Mr. Grimston, speaking as president of the Urban District Councils Association, said that it was not a party issue. Small local authorities were not getting the deal that the Parliamentary Secretary himself thought they would get by the arrangements.

Mr. Murray stated that the loss to one of the local authorities in his area was the equivalent of a 7d rate.

Mr. Robens, Parliamentary Secretary, Ministry of Fuel and Power, agreed it was not a political matter. If they were to withdraw the proposals and adopt the sliding scale recommended by the Urban District Councils Association there would be another prayer, with the difference that the members taking part would be speaking for the large authorities. It had taken 2½ years to agree on a common formula, and this one had been accepted by all authorities with the exception of the Urban District Councils Association. Whatever kind of formula was produced there would always be some snags. This formula provided rough and ready justice and represented a fair division of the money available on severance.

The motion was negatived by 212 votes to 179.

Exported Power Plant

Mr. Llewellyn asked the President of the Board of Trade what value of electricity generating plant had been exported to the U.S.S.R. and countries under Soviet influence, respectively.

Mr. Bottomley circulated the following information in reply, showing the value of United Kingdom exports of electrical generating sets and generators (including parts) exported

Country	1945	1946	1947	1948	1949	1950 Jan.-Sept.
	£(000)	£(000)	£(000)	£(000)	£(000)	£(000)
Soviet Union	861	905	1,469	1,158	4,281	4,340
Poland	0	—	108	19	25	23
Hungary	—	—	0	1	3	31
Czechoslovakia	—	6	8	1	3	6
Albania	—	7	9	—	—	—
Bulgaria	—	—	—	—	—	8

to the Soviet Union and to countries under Soviet influence during 1945–1949 and Jan.–Sept., 1950.

Power Station Emissions

Mr. Kaberry asked the Minister of Fuel and Power if he would now give a date by which the emission of grit and dust from the Kirkstall power station, Leeds, would cease ; and if, in addition, steps would be taken to prevent the spread of grit from the tipped piles of spent ash near the power station.

Mr. Noel-Baker said the British Electricity Authority assured him that before the autumn of 1951 the additional grit-arresting plant and the new high chimney at Kirkstall would be in full operation. The B.E.A. further informed him that active steps would be taken in 1951 to prevent the spread of grit from the tipped piles of spent ash near the power station.

Commander Noble asked the Minister of Health what report the Chief Alkali Inspector made on the pollution of the atmosphere by gases from the Battersea power station after his last visit.

Mr. Bevan said that the report pointed out certain shortcomings, which he understood had since been rectified.

B.E.A. Advertising

Mr. J. Boyd-Carpenter asked the Minister if he would make a statement on the general policy of advertising by the British Electricity Authority.

Mr. Noel-Baker replied that while advertising was in the normal course a matter of commercial management over which he had no direct responsibility, this question appeared to raise a matter affecting national interests and the policy of the Government. He had, therefore, without creating any precedent, asked the B.E.A. to inform him about the general advertising policy at the present time. The B.E.A. told him first that, being aware of the loss and inconvenience caused to industry and other users of electricity by the present shortage of generating plant, the Authority wished to assure consumers that it was bringing new power plant into operation as soon as it could do so.

Secondly, having accepted responsibility for the widespread advertising which was required to ensure that householders, office workers and others only used electricity when they must during the hours of peak demand, the advertising during the winter was concentrated on this problem of peak demand so that the frequency and severity of power cuts might be reduced as much as possible.

Mr. Boyd-Carpenter asked whether the B.E.A. had informed the Minister of the cost of the present poster campaign and would he also tell the House whether the portrayal of the erection of large numbers of power stations was calculated to increase or decrease public demand for electricity. Mr. Noel-Baker said that with regard to the last part of the question, he thought it would have neither one effect nor the other. With regard to the first part, that was another question.

Replying to Mr. A. A. Marlowe, the Minister said that advertising was to encourage people not to use electricity at peak hours. At non-peak hours of course it was necessary for people to use more electricity in order to keep the price down.

Coal Position

On Monday last the Minister of Fuel and Power made a statement on the present coal situation. He said that home consumption this year would be about 6 million tons more than last year. Output of open-cast coal would fall short by 750,000 tons of the estimated figure because of the bad weather during the past few months. As a consequence stocks at the end of October were 700,000 tons lower than had been hoped. To meet this deficit the Government was reducing coal supplies for shipping and had instructed the National Coal Board to purchase coal abroad.

In reply to questions Mr. Noel-Baker said that the output this year would be about 205 million tons—2 million tons more than last year. The Government would assure industry of at least the amounts already allocated.

FLUORESCENT STAGE LIGHTING

A SUCCESSFUL demonstration of stage lighting by "Atlas" fluorescent lamps took place in the New Assembly Hall, Queensway, Paddington, last week. Mr. A. Stanley Shier, director, Thorn Electrical Industries, Ltd., welcomed the guests and then called on Dr. H. H. Ballin to give a commentary on colour changing and mixing by means of dimmers. The latter, of quite modest dimensions, are of the multi-stud plate type incorporating banks of small radio-type resistors ; the chokes are separately stacked wherever most convenient.

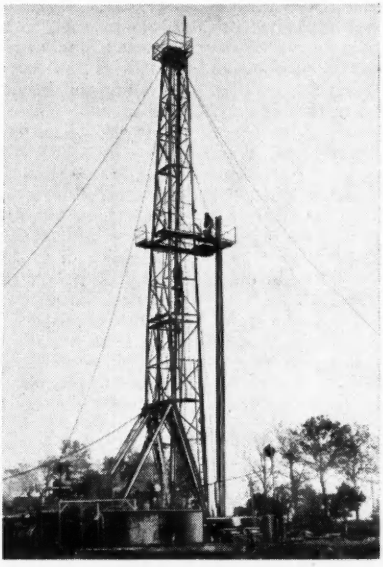
Dr. Ballin spoke mostly of the colour changing possibilities of the system, which are very varied, and the economic aspects. The amount of heat produced was noticeably reduced by comparison with filament lamps, while the demonstration was conducted with about one-third of the electrical loading that would have been needed for an equivalent filament lamp installation. The longer service life of fluorescent tubes reduces the cost of maintenance and lamp renewals. Colour filter screens, the replacement of which is an appreciable item in theatre expenses, are not used. Only the dark red and dark blue fluorescent lamps need to have filter sleeves.

Electricity in the Oil Industry—II

Oilfield Developments in North-East Holland

IN the article introducing this subject (*Electrical Review*, 17th November) we mentioned our inspection of the Royal Dutch/Shell oil wells near Schoonebeek in the north-east of Holland close to the German frontier. This is a 50/50 enterprise of the Royal Dutch/Shell and Standard Oil Co. (New Jersey). Though encouraging results were obtained from trial drillings in the neighbourhood in 1935 it was another nine years before test and exploration wells confirmed the existence of oil in quantities sufficient to justify economic development. Since then, however, 114 wells have so far been drilled on a systematic pattern 400 metres apart. All these wells, as well as those being sunk under Allied supervision over the German frontier, are of the shallow type —about 900 metres deep. In addition, experimental deep wells up to 4,000 metres are being drilled a few miles to the west.

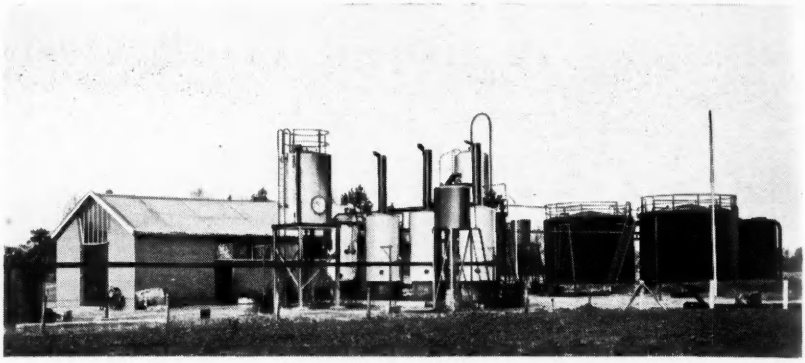
Even though comparatively small in relation to the demands of the refining side of the industry, the application of electricity to the oilfields is by no means insignificant. For the drilling operations, however, in view of the need for mobility and also a comparatively large amount of power, possibly of a temporary nature only (the striking of oil is not certain), it is the practice to employ diesel engines, though even here electricity from the public supply is employed for the lighting (drilling is a twenty-four hour a day job), water pumping, etc.



Transportable derrick employed for drilling operations in the Schoonebeek area

In Holland the practice of using portable derricks for drilling operation has been made possible by the greater portability of modern drilling equipment. Besides ensuring greater efficiency in the use of the drilling gear this system has the advantage that it does not spoil the appearance of the countryside and also, from a security point of view, avoids easily identifiable targets for air attack. The portable derricks are removed when the oil is flowing and only replaced when it is necessary to clean the tubing. For the shallow well drilling three diesel engines each of 200 h.p. are used. One of these drives a turntable which rotates at between 50 and 250 r.p.m. a hollow square rod 9 metres long, the top end of which is suspended from pulleys on the derrick. The lower end of this square rod screws into lengths of hollow tubing on the end of which is fastened the bit, varying in diameter from 5½in to 12½in.

The other two diesel engines are required to operate pumps which force a mixture of water and clay ("drilling mud") down through the centre of the drill pipes and back to the surface via the annular space between the drill pipe and the bore hole itself. The drilling mud, which is filtered and kept at its required consistency by a mixing pump, is re-circulated and besides clearing out debris and keeping the bit cool and clean also serves to plaster the walls to prevent their caving in. Although one

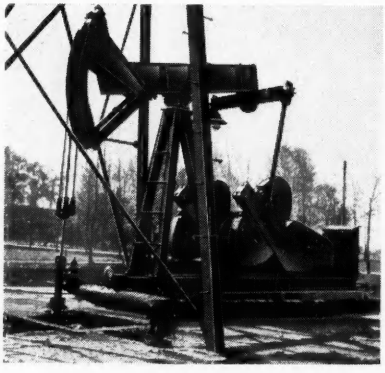


Testing and measuring station at which the oil from a number of wells is collected

diesel engine and pump are adequate for the circulation of this drilling mud, a breakdown would almost inevitably involve the abandonment of the particular drilling and it is for this reason that the installation incorporates a second diesel engine and pump unit which can be put into circulation immediately. When the drilling has reached a sufficient depth, the bore hole is permanently lined with steel tubing cemented into position, and a production string of tubing of smaller diameter is lowered into the hole. In the Schoonebeek area it takes about ten days to complete the wells to a depth of 900 metres. Boring has to be continuous and to facilitate night-work floodlights are provided.

The almost complete absence of natural gases here in the shallow wells does not provide conditions necessary for "gushing" so pumping has to be resorted to. For this purpose a pump cylinder is provided at the bottom of the flow string and a piston is moved up and down in this cylinder by means of thin rods. These pump rods are attached above ground to the beam of a pumping jack driven by a 380 V motor of between 3 and 10 h.p. running at about 960 r.p.m. Pumps can normally run unattended for one to three months without cleaning out, an operation which takes two days.

Between 40 and 50 tons of oil a day are produced by this pump, known locally as a "Ja-knikker" (or "Yes nodder")



In addition to the shallow wells experimental deep borings at between 2,000 and 4,000 metres are now being carried out in the neighbourhood of Gramsbergen, a few miles from Schoonebeek. Here for lighting, water pumping and various auxiliary services a transportable transformer station has been installed to reduce the mains voltage from 10 kV to 380/220 V. For safety reasons the cables are buried in the ground and provision is made for speedily cutting off the electricity supply to all equipment (with the exception of the lighting) by switches near the plant.

For the boring and circulating of the drilling mud three 12-cylinder 800 h.p. diesel engines are used, one serving as a standby for immediate use in case of failure of the mud circulating unit. These engines are provided with small electrically operated air compressors for starting. Drilling is carried out at the rate of half a metre every 24 minutes. As a considerable amount of gas is to be expected an automatic valve, operated by a 3 h.p. electric motor, is arranged to provide a counter pressure

by opening an air accumulator (supplied by a compressor) in the event of the gas being released.

As stated, 114 shallow wells, each producing an average of 30–40 cu metres of oil a day, have been sunk at Schoonebeek. The oil brought to the surface at these wells is pumped to one or other of fourteen testing stations where the output from each pump is first measured and then taken through a system of valves and pipes to whichever collecting tank (80–100 cu metres capacity) required.

The oil as received here contains a considerable amount of water, which besides being useless and expensive to pump is liable to corrode the tubing. The tendency for this water to sink to the bottom of the tanks is accelerated by heating by hot water coils, which also serve to render the oil thin to facilitate pumping to the main collecting station. The water which separates out from the oil is automatically removed with the aid of two double electrodes fitted in the tanks, one pair 6in from the bottom and the other a foot higher. When the water level reaches the top electrodes it actuates a 24 V electrically operated valve, and the water drains by gravity from the tank, the valve remaining open until the water level drops below that of the bottom electrodes. The pumps for circulating the hot water through the heating coils are operated by 6 h.p. electric motors. The small amount of gas produced from the wells with the oil is utilized as fuel for the water heating boilers.

The main electricity supply for the typical testing station which we visited is controlled by an Electro Mechanical Manufacturing Co.'s 350 A "Y" type switch with subsidiary switches covering the pump house, the well pumps and the salt water pumps. A watch is kept on the voltage by means of a Ferranti voltmeter and a kWh meter is provided for each well. The cables feeding the well pumps are laid in the same trench as the oil piping.

From the testing stations the oil is electrically pumped (the station we inspected had a 60 h.p. 1,470 r.p.m. motor to drive the

(1) Controlling the drilling operations; (2) Working at night on the drilling floor; (3) Inserting the drilling pipe in the rotary table

pump) to a central collecting station where it is stored in large receiving tanks, the biggest of which holds 2,700 cu metres, to await dehydration prior to despatch. In the electrostatic dehydration process employed the oil, which still contains 30–40 per cent water when it arrives from the testing stations, has a 16 kV charge transmitted through it from two electrodes set a certain distance apart. An electrical field is set up and the water particles vibrate, coalesce and sink by gravity to the bottom of the tank for removal in the same way as at the testing stations. By this means the water content is reduced to between 0·8 and 0·9 per cent. Desalting is also effected by this process, the salt content being reduced from 35 kg to 35 g per cu metre. About 500 cu metres can be so treated daily.

Three 60 h.p. 1,450 r.p.m. electric pumps are employed to pump oil between the tanks and for loading it into the oil trains which run twice a day to the Royal Dutch/Shell Refinery at Pernis, near Rotterdam. Each pump has a rated capacity of 125 cu metres an hour so that it is possible to load a train of 30 wagons each holding 48 cu metres of oil in about four hours. To further facilitate operations an additional fuel pump is being installed, as well as water and fuel pumps for the high pressure boilers.

We thank the Shell Organization for supplying the photographs used in this article.

Fire Research

RESEARCH on fires in buildings, aircraft and forests and on fire fighting equipment is described in "Fire Research 1949," published by H.M. Stationery Office for the Department of Scientific and Industrial Research and Fire Officers' Committee, price 1s 9d (45 cents U.S.A.), postage 2d extra. This 42-page illustrated publication includes the reports of the Fire Research Board and the Director of Fire Research for the year 1949 and indicates the widening range of work carried out by the Joint Fire Research Organization.

An analysis of the fires which occurred in 1948 has been completed and summary tables are given which compare fire incidents in the years 1946, 1947 and 1948. Some of these results are illuminating; one in five of the fires in buildings arose in connection with the domestic fire, one in six were associated with electrical apparatus of one kind or another, while the smoker continues to be responsible for about one in eight. Special analyses have also been carried out of fires in all kinds of post-war dwellings, of fires in ships in port and fires involving celluloid.

In post-war temporary houses there has been an increase in the rate of incidence of outbreaks resulting from electric cookers and short circuits, etc., in wires and cables. During 1948–49, 13 of the 22 fires caused by electric cookers resulted from the ignition of fat in cooking utensils and 5 from clothing hanging above or falling on to hotplates and catching fire. In 14 of the 49 incidents attributed to short circuits, fire spread to built-in cupboards, floors, walls, ceilings or roofs, but in the remainder it was confined to the wiring, fuse box, distribution board or switch panel.

With regard to fires in ships in port, 43 per cent of the outbreaks started in holds and machinery spaces; only about 5 per cent originated in cabins. The major source of ignition was welding and cutting apparatus to which 56 per cent of the fires in passenger ships and 37 per cent in non-passenger ships were attributed. Short circuits were among the three other chief causes, accounting for 20 per cent of the outbreaks in passenger ships and 29 per cent of those in non-passenger ships.

During the year good progress has been made in studies of the growth of fire in buildings by means of laboratory experiments with small models. A series of large-scale experiments has also been carried out in which the performance of certain types of construction in the standard test furnaces was compared and found to be in agreement with their behaviour under practical fire conditions in houses. Favourable advances have also been made in the design of instruments to meet the special requirements of fire studies. A self-contained radiometer the size of a hand camera has been constructed, and also an amplifier and selector that, with a suitable recorder, enable up to 25 thermocouples to be read automatically in turn at the rate of one every three seconds.

OVERSEAS ELECTRICAL TRADE

Big Improvement in Exports in October

AFTER September's somewhat disappointing returns the figures for exports of electrical apparatus and machinery during October are especially reassuring. At £12,033,319 they are nearly £2 million higher than in both the preceding month and also the corresponding month of last year and are only about £½ million below the record total of £12,388,673 in August. The improvement was shared almost equally between the apparatus and machinery sections.

Most of the increase in purchases of machinery relates to generating plant, particularly equipment of above 200 kW capacity, exports of which rose from £478,570 in October last year to £1,042,846. Russia took £662,545 of the total value of £1,453,916 of generating plant, Australia being next with £133,279. Over half of the £767,058 worth of electric motors exported came under the classification of units of from 1 to 250 h.p. : Australia (£150,047) was the largest customer, with South Africa (£109,329) next.

In the section covering transformers, convertors, rectifiers and switchgear South

TABLE I.—ELECTRICAL EXPORTS

Class	October, 1950	October, 1949
	£	£
Telegraph and telephone cables and wires (submarine)	22,969	86,734
Ditto, not submarine	541,088	828,489
Wires and cables, cotton, silk or artificial silk insulated	44,064	56,218
Ditto, enamel, glass or asbestos insulated	114,117	56,723
Ditto, paper insulated	474,666	725,858
Ditto, rubber insulated	448,843	303,424
Ditto, other	140,267	99,447
Commercial radio apparatus	611,384	242,249
Domestic radio apparatus	253,814	215,780
Telegraph, telephone and signalling apparatus	1,594,789	1,410,936
Radio loudspeakers	40,224	38,794
Sound reproducing apparatus, components, and parts other than cinematograph apparatus	441,940	267,993
Other sound reproducing apparatus	131,108	63,770
Radio valves	259,708	148,162
Electric lighting carbons	29,700	11,255
Lamps not exceeding 24 V	41,424	33,297
Discharge lamps	49,722	35,725
Other lamps	70,581	61,099
Other lighting apparatus	349,243	318,656
Primary batteries	120,191	70,983
Parts other than carbons	38,185	13,233
Accumulators for motor vehicles	122,987	160,548
Ditto traction	13,627	9,511
Ditto radio	2,033	3,855
Other portable accumulators	37,233	97,212
All other accumulators	61,222	48,111
Parts and accessories	51,184	53,165
Cooking appliances	125,689	69,632
Heating appliances	57,989	45,344
Parts and accessories for cooking and heating appliances	56,279	45,048
Flat irons	48,983	35,064
Commercial electrical instruments	112,602	90,708
House service meters	111,043	97,635
Time recorders and time switches	9,978	19,036
Other electrical instruments	134,769	108,339
Electro-medical apparatus (not X-ray)	48,310	39,728
X-ray apparatus, tubes and parts	66,151	69,627
Permanent magnets	15,281	15,964
Insulating cloth and tape	105,630	68,333
Other insulating materials	84,762	63,813
Unclassified electrical goods and apparatus	427,278	328,823
TOTAL electrical goods and apparatus	7,511,057	6,558,321
Generators, up to 200 kW	1,042,846	478,570
Ditto, over 200 kW	196,845	206,652
Ditto, parts	214,225	77,909
Motors, railway and tramway	18,322	42,412
Ditto, other, not over ½ h.p.	106,322	53,809
Ditto, over ½ h.p. but under 1 h.p.	47,721	38,399
Ditto, from 1 h.p. to 250 h.p.	401,041	456,318
Ditto, over 250 h.p.	87,347	52,229
Ditto, parts	106,305	60,463
Converting machinery	2,403	9,350
Transformers, including coils	659,979	636,593
Rectifiers for power house use	42,019	26,227
Motor starting and controlling gear	167,701	169,773
Switchgear and switchboards (not telegraph or telephone)	972,900	857,788
Other electrical machinery	73,122	22,934
TOTAL electrical machinery	4,139,098	3,189,426
Vacuum cleaners and parts	169,158	149,243
Other electrically operated portable appliances	132,928	149,765
Portable electric tools	81,078	104,154
GRAND TOTAL	12,033,319	10,150,909

Africa took £462,567 of the total of £1,918,124, Australia £298,711 and India £256,079.

There was a sharp fall in exports of telephone and telegraph cables, due largely to smaller shipments to Australia, India and South Africa. Other cables maintained their position fairly well thanks to large purchases by the same three countries. Although the exports of paper-insulated cables were lower the loss was counterbalanced by rises in other types.

Egypt was the largest buyer of domestic radio apparatus (£35,512 of a total of £253,814); South Africa and Malaya also took substantial amounts. Of the total of £1,594,789 shown for telegraph and telephone apparatus, Australia accounted for £683,049, South Africa for £169,600 and Argentina for £101,380.

Australia, South Africa and the Irish Republic were mainly responsible for the large rise in exports of cooking and heating apparatus. India (£38,611) and Sweden (£37,277) were the biggest importers of electrical instruments. Sweden also headed the list of importers of British commercial radio equipment.

TABLE II.—Distribution of Electrical Goods and Apparatus

Destination	Oct., 1950	Oct., 1949
	£	£
Channel Islands	47,889	37,547
Malta and Gozo	8,171	58,860
Cyprus	20,544	14,850
British West Africa	132,552	139,662
Union of South Africa	788,183	774,048
Northern Rhodesia	28,597	56,793
Southern Rhodesia	100,858	118,623
British East Africa	198,194	110,720
Bahrein, Koweit, Qatar and Trucial Oman	20,855	50,265
India	688,322	621,963
Pakistan	113,941	89,179
Malaya	220,423	278,231
Ceylon	82,893	65,643
Hong Kong	167,311	167,277
Australia	1,269,786	1,069,421
New Zealand	248,740	302,203
Canada	186,324	93,457
British West Indies	103,405	62,139
Anglo-Egyptian Sudan	19,238	18,526
Other Commonwealth Countries	61,695	57,720
Irish Republic	234,578	182,773
Soviet Union	34,399	37,424
Finland	42,162	23,188
Sweden	312,350	141,086
Norway	167,693	112,741
Iceland	6,205	16,795
Denmark	126,085	58,969
Poland	48,034	43,140
Germany	34,264	17,348
Netherlands	168,169	123,571
Belgium	91,508	69,833
France	135,362	64,735
Switzerland	37,362	47,442
Portugal	50,742	30,837
Spain	6,955	59,292
Italy	27,186	18,504
Austria	16,080	31,521
Hungary	8,345	15,367
Czechoslovakia	24,081	24,778
Greece	25,398	40,512
Turkey	111,518	37,396
Indonesia*	9,586	15,569
Netherlands Antilles	3,867	5,065
Portuguese East Africa	21,109	11,343
Syria	9,589	12,905
Lebanon	10,719	23,502
Israel	41,854	26,134
Egypt	111,522	228,291
Arabia	7,185	3,887
Iraq	86,623	54,533
Iran	146,270	163,228
Burma	18,286	23,161
Thailand	31,321	25,822
China	262	823
United States of America	136,608	28,205
Mexico	3,536	18,535
Colombia	4,906	7,342
Venezuela	52,031	67,435
Chile	13,183	19,144
Brazil	206,441	77,053
Uruguay	9,010	14,510
Argentine Republic	193,550	222,335
Other Foreign Countries	127,202	107,108
Total	7,511,057	6,558,321

* Includes Netherlands New Guinea in 1949

Electricity in France

WHILE the Gaz de France and Electricité de France nationalized groups are to some extent distinct organizations and are operated separately in the large towns, in the provinces they have hitherto worked closely together. Since nationalization, Electricité de France has subsidized Gaz de France in order to provide cheap gas. The recent decision to increase the price of gas substantially has eased the electricity budget and there seems no reason now why the two organizations should not be completely separated throughout the country. The change, if it is undertaken, will also lead to the decentralization of Electricité de France. Regional offices will have more power, but many of the small local offices will have some independence taken away from them, as they will come directly under the regional organization. While this is welcomed generally, it is also hoped that where it has been possible to pay for gas and electricity at the same time this practice will be continued.

Illumination Design Course

FOR the first London evening Illumination Design Course (59th) this autumn, organized by the Lighting Service Bureau, so many had to be refused admission owing to lack of space, that it was decided that the entire course should be repeated on 13th November. A total of 350 tickets, the maximum capacity, were issued for the first course and 320 for the repeat. The Bureau has also this autumn been running similar courses in a number of provincial towns and in Scotland.

ELECTRICITY SUPPLY

Clarence Dock Ceremony
Prepayment Meter Policy

TO commemorate the approaching completion of Clarence Dock power station, Lord Citrine (chairman, B.E.A.) on 14th November officially "laid" a 4ft high block of granite bearing an inscription recording the event. The granite block was previously part of Clarence Dock. Referring to the power situation, Lord Citrine said that as far as he knew they had taken every step they could to expedite the building of power stations, but unfortunately they were not free agents. He mentioned, for example, the new power station at Bromborough which would not come into operation on the date originally planned because certain parts of the plant had not yet arrived on the site. He also spoke of objectors who, although they realized the need for additional electricity, invariably said "Don't build your power station here." With regard to the Clarence Dock station, he said it had been planned with a good deal of foresight though the site was too small by modern standards—11½ acres compared with 100 acres or more in the case of some stations he had visited.

Prepayment Meters

Gateshead Town Council has followed the example of several other local authorities in the Area in drawing the attention of the North Eastern Electricity Board to the difficulty experienced by tenants of "all electric" houses in paying quarterly electricity bills. The Board has stated that it is the national policy to fit quarterly meters owing to the high cost of installing slotmeters. It is added, however, that as the question has been raised by many local authorities, the B.E.A. has appointed a special committee to consider the whole matter.

Preserving Cut Flowers

An interesting application of electricity for a consumer at Wisbech (Fens Sub-Area) is described in the *Eastern Electricity Bulletin*. It relates to the preservation of cut flowers and for this purpose a storage room measuring 30ft by 20ft by 8ft high will be insulated with 3in slab cork and the temperature maintained at 35 deg F, with an approximate humidity of 85 per cent. With these conditions it is expected that the flowers stored in the room will remain in good condition for four to five weeks. The temperature and humidity will be obtained by the use of a Coldrator 2 h.p. condensing unit and four forced-draught evaporator coils, one for each corner of the room. The flowers, after cutting, will be placed in buckets without water and stored on wooden shelving in the room.

Arts and Crafts Exhibition

Following the arts and crafts exhibitions which have been held in each of the six Sub-Areas of the Eastern Electricity Board (in conjunction with the B.E.A. Eastern Division) an Area exhibition is to be held tomorrow (Saturday) in the large Assembly Hall at the Wood Green Service Centre (Northmet Sub-Area). It is anticipated there will be about 300 exhibits from which will be selected the Area's exhibits to be shown at the national arts and crafts exhibition at the Horticultural Hall, Vincent Square, Westminster, S.W.1, on 11th, 12th and 13th January next.

South Australian Rural Supplies

The Electricity Supplies (Country Areas) Bill recently passed its second reading and committee stages in the South Australian Legislative Council without amendment. The measure makes provision for further supplies of electricity to the sparsely settled areas of the State by the appropriation of £1 million out of general revenue and by the granting of subsidies to municipal and district councils.

Canadian Power Scheme

Preliminary work on a power project on the Mayo River in the Yukon will be started this year. Tenders have been called for preliminary rock work, involving blasting out sites for a dam and for a power house. Tunnels also will have to be dug from behind the dam to the power turbines. The scheme, which is expected to cost about $3,000,000 and take two or three years to complete, will initially produce 3,000 h.p., but will be extended to meet additional demands. The power will be sold mainly to mines in the Mayo district.

Public Lighting

Bedford Corporation Highways Committee proposes to submit to the Ministry of Transport for approval a scheme for the provision of fluorescent street lighting in various roads at an estimated cost of £20,960.

French Power Production

Five-Year Programme

UNDER the auspices of the Cultural Relations Department of the French Embassy, and by courtesy of the Dean of the College, a public lecture in English on "The Development of Electrical Power Supply in France since the end of the War" was given by Monsieur Raymond Giguet, Directeur de l'Equipement, Electricité de France, at Imperial College (City and Guilds College), London University, recently. Professor Willis Jackson, of the Electrical Engineering Department of Imperial College, presided.

M. Giguet commenced with an outline of development during the past twelve years: he said that the total output had risen from 20·8 million to 30·1 million kWh, with a low output of 16·1 million kWh in 1944. The proportion of hydro-power was normally about 50 per cent, though in 1944 it was 64 per cent owing to heavy rainfall and limited industrial activity, and 37 per cent in 1949 owing to severe drought and intense industrial activity. In France the annual output *per capita* was 750 kWh, in Britain 900, in the U.S.A., Sweden and Switzerland 2,000.

Restrictions Lifted

France was faced with the urgent task of increasing its electricity production at almost any cost. A five-year economic plan had been made, under the control of M. Jean Monnet, with 39·5 million kWh as the target for 1952. Restrictions had been practically abolished ten months ago and consumption now followed a "natural" process of development.

Statistical studies of rainfall and river flow were in hand to determine the best proportion of coal to hydro-power to meet the winter demand. Maximum use of thermal stations burning low-grade coal from many French mines and blast furnace gases in local stations was aimed at because it had been necessary until recently that the power station consumption of higher-grade commercial coal should not exceed that of 1938. There was increasing use of steam at about 1,000 lb/sq in and 950 deg F with 40 MW to 100 MW turbo-generators. There would be several new stations of 300 MW capacity, or more, and others of 60–100 MW to use low-grade coal in mining areas. Extensions to other stations were being made and a 14·5 MW gas turbine plant was under construction at St. Denis.

Several hydraulic areas had outputs of 10 million kWh and there would be a three-fold increase of the reserve of power stored by reservoirs built under the new programme. In the Alps the Tignes Dam (360ft high) and associated plants were complete; in the Massif Centrale the Bort and Laigle plants had been completed; others were under construction, including new schemes in the Rhone Valley, the Alps and the Pyrenees.

Network Extensions

For transmission and interconnection in areas of high load density, 150 kV sufficed and 220 kV lines (incorporating some conversions from 150 kV) were being extended at the rate of over 500 miles a year. Distribution networks were increasingly overloaded and work needed on them, perforce postponed, could not be put off indefinitely.

Expenditure on equipment was very great. A further outlay of 400 billion francs was required, 289 billion, or about 40 per cent of the total, having already been spent. Marshall aid was of value to France in this as in other spheres, but France was devoting more of her own funds to electrical equipment than ever before.

M. Giguet concluded that the building capacity of the French electrical industry was such that there was no risk of "saturating" the electrical machinery manufacturers. Rather, to prevent electricity supplies from limiting industrial effort, there ought to be no hesitation in launching further schemes when the Monnet plan was complete. The speaker showed a film of the construction of a hydro-power station, which will come into operation in the Dordogne Valley in 1951. Mr. C. W. Marshall, deputy chief engineer (research) of the B.E.A., proposed a vote of thanks to M. Giguet.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Ferranti, Ltd.—Particulars were advertised on Monday last in connection with an application to the London Stock Exchange for permission to deal in and for quotation for £500,000 5 per cent second redeemable cumulative preference shares, part of a total issued capital of £1,500,000, consisting of £500,000 7 per cent cumulative preference shares of £1 each and 1,000,000 ordinary shares of 10s each, in addition to the 5 per cent second preference shares. The advertised particulars showed the £500,000 5 per cent preference shares to be covered 3.39 times as to capital and 6.95 times as to dividend. Approximately 300,000 of these shares have been the subject of a placing and it was anticipated that dealings would commence on the London and Manchester Stock Exchanges yesterday (Thursday) at around 20s 9d per share.

Joseph Lucas, Ltd., reports a consolidated surplus for the year to 31st July last, after deducting income tax, of £1,359,474, as compared with £862,790 for the preceding year. After crediting non-trading income of £108,818 and deducting profits retained by subsidiaries, the net profit of Joseph Lucas is £828,362 (against £642,379). It is proposed to pay a final ordinary dividend of 5 per cent, making 6⅔ per cent for the year on capital increased by a 200 per cent bonus issue. This compares with 17½ per cent paid in the previous year on the old capital.

Lightalloys, Ltd., reports a profit for the year ended 2nd July last of £68,651, as compared with £68,231 for the preceding year, and after deducting directors' remuneration, £11,447, and depreciation, £6,741, there is a balance of £50,463 (against £50,271), to which is added E.P.T. recovered of £1,021. Taxation absorbs £27,253, and it is proposed to pay a final dividend of 15 per cent (against 10 per cent), making 20 per cent for the year (against 15 per cent). The balance carried forward is £11,031 (against £12,371 brought in).

S. Smith & Sons (England), Ltd., report consolidated profits for the year ended 5th August last of £1,101,580, as compared with £860,143 for the previous year. Taxation requires £681,400, and the consolidated net profit is £420,180 (against £346,718), to which are added items relating to the previous year of £27,832. The net profit of the parent company is £325,012 (against £286,645). The final preferred ordinary dividend is 10½ per cent, making 17½ per cent for the year (same), and the distribution for the year on the deferred ordinary is maintained at 37½ per cent.

The London Electric Wire Co. & Smiths, Ltd., is holding an extraordinary meeting on 12th December at which resolutions will be submitted for increasing the capital to £2,000,000 by the creation of 750,000 £1 ordinary shares.

Tube Investments, Ltd.—Details are to be given at an extraordinary general meeting on 13th December of proposals for raising new capital. It is reported that the amount is £5 million in 4½ per cent redeemable cumulative preference shares of £1 each.

J. Stone & Co., Ltd., have declared an interim dividend of 5 per cent (unchanged).

The Telephone Manufacturing Co., Ltd., is paying an interim dividend of 2½ per cent (same).

Yarrow & Co., Ltd., propose to pay a dividend for the year of 10 per cent, tax free, and a bonus of 5 per cent, tax free (both unchanged).

Richard Johnson & Nephew, Ltd., have declared an interim dividend of 5 per cent (unchanged).

Johnson & Phillips, Ltd., have announced an interim dividend of 7½ per cent (same).

Ward & Goldstone, Ltd., are paying an interim dividend of 20 per cent (same) on increased capital.

Aberdare Cables of South Africa, Ltd., is paying a dividend for the year of 6 per cent (unchanged).

New Companies

Compressors & Installations, Ltd.—Registered 9th November. Capital £800. Engineers, electricians, founders, smiths, manufacturers of and dealers in air compressors and equipment, electric motors, etc. Directors: W. Longland and Elsie M. W. Longland. Regd. office: 126, Fanshawe Avenue, Barking, Essex.

Dale Electric (Export), Ltd.—Registered 7th November. Capital £1,000. Subscribers: C. E. Lumb and H. E. Ruming. Regd. office: 23, Eccleston Street, S.W.1.

Electrical Percussion, Ltd.—Registered 8th November. Capital £100. To acquire from Speed Movements, Ltd., the benefit of certain existing inventions relating to electro-

mechanical high speed operating gear, and to carry on the business of electro-mechanical, electrical and motor engineers, etc. Subscribers : Speed Movements, Ltd., and English Drilling Equipment Co., Ltd. Solicitors : Kenneth Brown, Baker, Baker, Essex House, Essex Street, W.C.2.

Litecraft (Glasgow), Ltd.—Registered in Edinburgh 9th November. Capital £5,000. Radio, electrical, motor, mechanical and general engineers, etc. Subscribers : A. Woker and Mrs. M. Woker. Regd. office : 7, West Campbell Street, Glasgow.

Modernair (Processes), Ltd.—Registered 10th November. Capital £2,000. Heating, ventilating, electrical and mechanical engineers, etc. Directors : J. C. E. Parrott and Constance E. Parrott. Regd. office : 85, Lillie Road, Fulham, S.W.6.

J. F. Thomas (Sound Reproduction), Ltd.—Registered 10th November. Capital £1,000. Recording and amplifying engineers and contractors, by electrical and other means, etc. Directors : V. Harrop and J. F. Thomas. Regd. office : 28, Howard Street, Glossop, Derbyshire.

E. J. Honeybun, Ltd.—Registered 13th November. Capital £2,000. Electrical, mechanical, motor and general engineers, etc. Directors : E. J. Honeybun and Marjorie G. Honeybun. Regd. office : 3, Park Place, Cardiff.

Exhibitions (Electrical), Ltd.—Registered in Belfast 3rd November. Capital £100. Electric wiring for exhibitions, displays and shows; electrical and radio engineers, etc. Directors : Elsie Ferguson, G. T. Carse, A. O'Grady and S. F. Cox. Regd. office : 44, Upper Arthur Street, Belfast, Northern Ireland.

Stabulag Co., Ltd.—Registered 10th November. Capital £3,000. Designers, manufacturers and importers and exporters of and dealers in scientific, precision, electrical, mechanical, chemical, heat changing, laboratory and thermostatic plant, instruments and appliances, etc. Directors : F. A. York and D. G. Jones. Regd. office : 1, Broad Street Buildings, Liverpool Street, E.C.2.

Liquidations

Barking Electrical Co., Ltd., Witney Chambers, Longbridge Road, Barking, Essex.—At a meeting of creditors in London on 14th November a statement of affairs was submitted showing liabilities of £8,419 and net assets of £2,134 leaving a deficiency as regarded creditors of £6,285. The issued share capital of the company amounted to £100. A resolution was passed confirming the voluntary liquidation of the company with Mr. N. W. Osborne, C.A., 11/12, Finsbury Square, London, E.C.2, as liquidator, with a committee of inspection.

Clayton, Lewis & Miller, Ltd., Finsbury House, Bloomfield Street, London, E.C.2, electrical appliance manufacturers.—The first meeting of creditors was held in London on 14th November when the Official Receiver reported that the winding-up order was made on 9th October. The statement of affairs disclosed gross liabilities amounting to £15,613. The total assets were estimated to produce £626 and were insufficient to the extent of £5,259 to meet the claims of the preferential creditors and debenture holder. There was, therefore, a deficiency as regarded creditors of £14,987. A resolution was passed for the appointment of Mr. D. D. Mathieson, C.A., 103, Cannon Street, London, E.C., as liquidator.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month from 15th November:—

VESTAC and VESTRON. Nos. 685,072–3 respectively. Class 9. Electric control apparatus for cranes, hoists and the like lifting and loading appliances. Vaughan Crane Co., Ltd., Vaughan Street, West Gorton, Manchester.

FONOCO (design). No. 676,853. Class 9. Apparatus for controlling the speed of public vehicles; electric batteries, coils, cigar lighters, insulated wires and cables, circuit breakers, relays, radio receiving sets (complete), etc., included in Class 9; ammeters; temperature, fuel and oil gauges; and electric fuses, switches and condensers.—Ford Motor Co., Dearborn, Mich., U.S.A. Address for service: c/o Stevens, Langner, Parry & Rollinson, 5–9, Quality Court, Chancery Lane, London, W.C.2.

BLOMAG. No. 685,485. Class 9. Magnets.—H. S. Greenwood & Sons, Ltd., 47, Princess Street, Rochdale, Lancs.

AVOCET (design). No. 689,342. Class 9. Electrical instruments and apparatus not included in other classes; apparatus, instruments, and devices for use in radio reception and transmission, etc.; scientific, etc., apparatus and instruments; and parts (not included in other classes) of all such goods.—Automatic Coil Winder & Electrical Equipment Co., Ltd., 21, Douglas Street, London, S.W.1.

LYTEZE. No. 689,753. Class 9. Electric irons for sealing paper wrappings of packages.—Lyteze Products, Ltd., Morses Lane, Brightlingsea, Essex.

SOLIDEX. No. 690,231. Class 9. Electrical apparatus and instruments included in Class 9; and scientific, signalling, etc., apparatus and instruments; talking machines, etc. No. 690,233. Class 11. All goods included in Class 11.—Société d'Exploitation Verriere "Beauce-Bourgogne," Paris. Address for service: c/o Mewburn, Ellis & Co., 70–72, Chancery Lane, London, W.C.2.

LION (Design). No. 686,418. Class 11. Installations for heating, steam generating, cooking, drying, ventilating, etc.—Spojené, Smaltovny a Závody na Kovové Zbozi, Narodni Podnik, Prague, Czechoslovakia. Address for service: c/o Reddie & Grose, 6, Bream's Buildings, London, E.C.4.

STOCKS and SHARES

THE recently developed strength in most of the Stock Exchange markets shows little sign of abatement. It is true that business comes patchily. One day may see activity and rising prices ; on the next, something of a lull is probable, with less firmness in the majority of quotations. On balance, however, the bulls certainly have matters in their favour at present, and the abundance of money available for investment continues to be an outstanding feature, exemplified by the success of any good new issue that comes along. Prices in the gilt-edged market, including those for British Transport and British Electricity stocks, remain upon an even keel, attracting, however, considerable investment business and absorbing substantial amounts of capital.

Dividend Policy

Expectations were well satisfied with the expansion of close on half-a-million disclosed last week in the J. Lucas preliminary profits statement, and with the strictly moderate increase in the dividend. Quoted at 32s 6d before the announcement, the shares were initially sold down to 31s but recovered almost immediately to 32s 6d ex-dividend. Allowing about 7d net for the dividend deduction, the price is that much to the good on balance.

Apart from the Lucas declaration, practically every day is bringing signs of a cautious relaxation of dividend policies, and, as a corollary, more weight to the investment bias in favour of currently repressed dividends. Persistent strength in Reyrolles and C. A. Parsons shares was mentioned here recently as being associated, in the market's opinion, with such considerations. Both have advanced further—to 74s and 75s respectively—and other issues now coming in for particular attention include Automatic Telephone & Electric " B " deferred and A.E.I. ordinary. The former are in short supply at about 58s 6d, which makes the yield 4¼ per cent on the 12½ per cent paid for 1949. Total dividends on ordinary and deferred in that year took less than £90,000 net out of available group earnings of nearly £600,000. A.E.I., now 82s 6d—a gain of 6s since a week ago—yield under 3¾ per cent from this year's 15 per cent dividend, paid out of earnings of 92 per cent.

The Week's Price Changes

British Insulated Callender's are a florin better at 35s, and gains of 1s 3d made Mather & Platt 39s 6d, Thorn Electrical 20s, Electric Construction 61s 3d, and Greenwood & Batley 47s 6d. Hall Telephone Accessories hardened to 16s, Hoover to 50s 6d. Tube Investments, 6¼, are ex dividend. British Electric Traction deferred rose 20 points, to 505 : a moderate business was done at the round 500. East African Power improved to 36s 3d. Falls have been few and insignificant over the past week. The Indian utilities eased off. Anglo-American Telegraph preferred lost 1½ points to 92½. Cossors at 9s 6d and De La Rue at 23s have gone back 6d and 1s respectively. London Electric Wire shares retained their rise to 51s 3d, unaffected by the proposal to increase the capital to £2 million by the creation of 750,000 ordinary shares.

New Issues

The capital of Ferranti, Ltd. consists of half-a-million each of 7 per cent preference, 5 per cent second preference, and ordinary stock. Up to now, the first-named has been the only means for public participation in the company, the others being in private hands. Arrangements are now being made for a market placing of part of the second preference, to the extent, it is reported, of about 300,000 shares. They are expected shortly to be in the market at about 20s 9d. The 7 per cents are officially quoted at 29s 6d. British Aluminium's new ordinary shares, offered at 34s, are changing hands around 5s 6d premium. The old shares are quoted at 39s ex rights.

S. Smith & Son's Results

Trading profits of S. Smith & Son topped the million mark in the year ended last August. After taxation of £681,000, net profit works out £44,000 above last year's, at £448,000. Dividends, however, remain at the same rates as before. Including the preference, they absorb altogether less than £100,000. A measure of disappointment over the absence of any extra payment to stockholders was responsible for a temporary setback in the price of the 1s deferred units from 10s 6d to 9s 9d, but they picked up quickly to 11s. They are now on a yield basis of under 4 per cent.

Five Per Cent Upwards

A round 5 per cent on the money is available from moderate lines, at present on offer, of Dubilier Condenser 1s shares at 2s 6d, and Christy Bros. £1 shares at 24s. In both cases the dividend is covered more than five times by the latest earnings. Scottish Cables ordinary are also offered at 24s. Rheostatic 4s shares can be bought at 8s 6d to give just over 6½ per cent. Aberdare Cables £1 shares at 14s 9d return 6¾ per cent and Hall Telephones at 16s 3d, a little more than 6¼ per cent. In the higher yield ranges, Strand Electric 5s shares at 11s return nearly 8 per cent and Electrical Components 5s shares at 11s 3d, about 8¾ per cent.

NEXT WEEK'S EVENTS

Monday, 27th November

BIRMINGHAM.—James Watt Institute, 6 p.m. I.E.E. South Midland Radio Group. "Analogies," by Prof. M. G. Say.

BOURNEMOUTH.—Grand Hotel, 8.15 p.m. A.S.E.E. Bournemouth Branch. "The History of Electric Washing Machines," by G. A. Williams.

CAMBRIDGE.—Cavendish Laboratory, 8.15 p.m. I.E.E. Cambridge Radio Group. "Some Aspects of Frequency Modulation," by Group Capt. W. P. Wilson. (Joint meeting with Cambridge University Wireless Society.)

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Supply Group. "The Cost and Efficiency of Earthing on Low- and Medium-Voltage Overhead Line Systems," by L. Gosland. (Joint meeting with the Western Utilization Group.)

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Informal meeting. Discussion on "The Case for Induction Generators," opened by I. M. E. Aitken.

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "The Control of Hydro-Electric Plant," by A. C. H. Frost and W. Brittlebank.

Tuesday, 28th November

GLOUCESTER.—Cadena Café, Eastgate Street, 6 p.m. I.E.E. Western Centre. District meeting. "The Cost and Efficiency of Earthing on Low- and Medium-Voltage Overhead Line Systems," by L. Gosland.

LEEDS.—Lighting Service Bureau, 24, Aire Street, 6.30 p.m. I.E.E. North Midland Utilization Group. "Some Aspects of Agricultural and Horticultural Electrification in North America," by F. E. Rowland.

LONDON.—Savoy Place, W.C.2. 3.30 and 5.30 p.m. I.E.E. Measurements Section. Symposium of papers on "Radiation Monitoring Apparatus." (Joint meeting with Radio Section.)

At the Royal Society of Tropical Medicine and Hygiene, Portland Place, W.1, 7 p.m. Society of Instrument Technology. "The Measurement of Viscosity," by Dr. A. R. Boyle.

Wednesday, 29th November

LONDON.—I.E.E. London Students' Section, 2.30 p.m. Visit to Bailey Meters, Ltd., Croydon.

MANCHESTER.—Engineers' Club, Albert Square, 6.30 p.m. I.E.E. North-Western Radio Group. "Crystal Diodes," by R. W. Douglas and Dr. E. G. James. "Crystal Triodes," by T. R. Scott.

MIDDLESBROUGH.—Cleveland Technical Institute, 6.30 p.m. I.E.E. North Eastern Students' Section. "Calculating Machines," by C. G. Hopper.

SHEFFIELD.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. "Selection of Transformers for Use in Distribution Networks, with special reference to the New Low-Voltage Standard of 240 Volts," by E. Tobin.

Thursday, 30th November

EXETER.—Rougemont Hotel, 3 p.m. I.E.E. South-Western Sub-Centre. "The Planning of an Electricity Board's Distribution System," by G. O. McLean.

Agricultural House, Queen Street, 7 p.m. I.E.S. Exeter Group. "Lighting in the Home," by Miss M. Wardlaw.

LONDON.—At the Royal Society of Arts, John Adam Street, W.C.2. Institution of Engineering Inspection. "Non-Destructive Testing in Steelworks Inspection," by J. F. Hinsley.

LUTON.—George Hotel, George Street, 8 p.m. A.S.E.E. Luton Branch. "Power Factor Correction and Power Capacitors," by J. Orr and A. E. Walker.

NORTHAMPTON. — Electrical Power Engineers' Association. Midland Technical Group. 7 p.m. "Busbar Zone Protection," by H. Hurst.

NOTTINGHAM.—Gas Showrooms, Parliament Street, 5.30 p.m. I.E.S. Nottingham Centre. Presidential address, by L. J. Davies.

Friday, 1st December

BIRMINGHAM.—Imperial Hotel, 6 p.m. I.E.S. Birmingham Centre. "Floodlighting," by R. O. Ackerley.

BRISTOL.—Grand Hotel, 7 p.m. I.E.S. Bath and Bristol Centre. "Lighting in the Home," by Miss M. Wardlaw.

HUDDERSFIELD.—Electricity Showrooms, Market Street, 7.15 p.m. I.E.S. Huddersfield Group. "Illuminated Signs and Display with Discharge Tubes," by C. Higgins.

LONDON.—Savoy Hotel, W.C., 6.30 p.m. Association of Electrical Machinery Trades. Dinner, dance and cabaret.

MANCHESTER.—Engineers' Club, Albert Square, 6.45 p.m. Manchester Association of Engineers. "Engineering Aspects of Film Production," by R. H. Cricks.

South African Trade

ELECTRICAL imports into South Africa, according to official returns issued in Pretoria, declined in value during the first half of this year by about 30 per cent compared with the corresponding period of 1949. The principal items are shown in the accompanying table. It will be seen that the decrease in cable and wire and stoves was particularly heavy, while the only increases were in generators and transformers.

Class of Goods	January to June 1949 Thous. £	January to June 1950 Thous. £
Electric batteries and parts ..	414	215
Dynamos and generators ..	281	464
Motors	795	676
Transformers	426	790
Cable and wire (rubber insulated)	491	124
" " " (other insulation)	1,002	346
Electric stoves and parts ..	319	56
Lamp bulbs	229	156

South African exports of electrical cable and wire were valued at £326,000 during the first half of this year compared with £156,000 during January-June, 1949.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1943

21768. Sperry Gyroscope Co., Inc.—Production of modulated high-frequency oscillations. 28th December, 1943. (647700.)

1944

1688. Sperry Gyroscope Co., Inc.—Ultra high-frequency apparatus having modulation control means. 13th March, 1944. (647702.)

17305. Stevens, A. H. (Submarine Signal Co.).—Control system for electric motors. 11th September, 1944. (647640.)

20729. British Thomson-Houston Co., Ltd.—Electron lens systems. 25th October, 1944. (647703.)

25214. British Thomson-Houston Co., Ltd.—Electroplating control systems. 15th December, 1944. (647704.)

1945

11725. Standard Telephones & Cables, Ltd., and Smyth, C. N.—Electron discharge devices. 10th May, 1945. (647641.)

1946

21364. Valensi, G.—Generation of electrical oscillations. 17th July, 1946. (647761.)

21949. Murphy Radio, Ltd., and Tomes, S. R.—Dielectric heating apparatus. 21st April, 1949. (647762.)

23860. Western Electric Co., Inc.—Trace blanking circuits for cathode-ray oscilloscopes. 12th August, 1946. (647711.)

24484. Bataille, R., and Honorat, G.—Frequency-changing arrangements in radio transmitters and receivers. 16th August, 1946. (647643.)

27471. Oberli, E.—Static equipment for arc and resistance welding. 12th September, 1946. (647712.)

30449/0. Columbia Broadcasting System, Inc.—Colour television. 11th October, 1946. (647714/5.)

36607. Legerth, K. I. B.—Intercommunication systems. 11th December, 1946. (647765.)

1947

941. Philips Lamps, Ltd.—Synchronization in television and like receivers. 10th January, 1947. (647767.)

3031. Standard Telephones & Cables, Ltd.—Sweep circuit arrangements for cathode-ray tubes. 31st January, 1947. (647769.)

3984. Soc. Francaise Radio-Electrique.—Amplifiers having a controlled response curve. 11th February, 1947. (647770.)

6462. Standard Telephones & Cables, Ltd. (Federal Telecommunication Laboratories, Inc.).—Telecommunication exchange. 7th March, 1947. (Convention date not granted.) (647773.)

11463. British Thomson-Houston Co., Ltd., and Pohl, R.—Excitation of direct current dynamo-electric machines. 18th October, 1948. (647825.)

11857. Standard Telephones & Cables, Ltd.—Television broadcasting system. 2nd May, 1947. (647775.)

12136. Smith & Sons (England), Ltd., S., Furzehill Laboratories, Ltd., and Milsom, F. R.—Automatic control systems. 30th April, 1948. (647776.)

12668. Marconi's Wireless Telegraph Co., Ltd., Dawson, L. H., and Brandon, P. S.—Radio location and detection arrangements. 22nd April, 1948. (647583.)

13204. British Thomson-Houston Co., Ltd.—Electric discharge devices. 16th May, 1947. (647778.)

13792. Locan, A.—Colour television. 5th December, 1947. (647780.)

16724. Wilkinson, G. H.—Electric irons. 5th June, 1948. (647586.)

21275. Sylvania Electric Products, Inc.—Direct-reading recording meters. 5th August, 1947. (647725.)

22259. British Thomson-Houston Co., Ltd.—Pulse-producing systems. 11th August, 1947. (647828.)

23100. Standard Telephones & Cables, Ltd., and Ransom, D. H.—Circuits for cold cathode gas discharge tubes. 20th August, 1948. (647646.)

29079. Smith & Sons (England), Ltd., S., Moss, E. B., and Cooper, C. W.—Electrical indicating devices. 29th October, 1948. (647651.)

31085. Duyck, G.—Electro-magnetic brake or clutch. 24th November, 1947. (647832.)

32538. Pye, Ltd., and Green, J. D. F.—Snap-action thermal switches. 9th December, 1948. (647653.)

32987. Wallace & Tiernan Products, Inc.—Electrical cell apparatus for detecting chemical characteristics of liquids. 15th December, 1947. (647740.)

34013. Phoenix Telephone & Electric Works, Ltd., and Downing, H. F.—Apparatus for calling attendants and for like purposes. 26th August, 1949. (647795.)

34141. British Thomson-Houston Co., Ltd.—Excitation of dynamo-electric machines. 24th December, 1947. (647655.)

34327. Gretener, E.—Electric remote control system. 29th December, 1947. (647834.)

35058. Tesla Electrical & Radio Industry National Corporation.—Cable detector. 31st December, 1947. (647837.)

35113. Poor & Co.—Electroplating method employing pulsating current. 31st December, 1947. (647799.)

35171. Poeschl, R., and Poeschl, W.—Support for dynamo-electric machines. 31st December, 1947. (647838.)

1948

1818. Faximile, Inc.—Synchronizing circuit. 21st January, 1948. (647841.)

2126. Western Electric Co., Inc.—Electro-magnetic relays. 23rd January, 1948. (647843.)

4598. Patelhold Patentverwertungs- & Elektro-Holding Akt.-Ges.—Ultra-short-wave amplifier. 17th February, 1948. (647844.)

4788. British Thomson-Houston Co., Ltd.—Demodulators for frequency-modulated signals. 18th February, 1948. (647845.)

6711. Marconi's Wireless Telegraph Co., Ltd., Brailsford, J. D., and Vass, E. B.—Radio direction finders. 3rd March, 1948. (647804.)

6782. Measurement, Ltd., Hewlett, S. J., and Wolfenden, R. H.—Rotors of electricity meters and the like. 7th February, 1949. (647847.)

6819. Marconi's Wireless Telegraph Co., Ltd., and Jolliffe, S. A. W.—Navigation aiding radio systems. 23rd December, 1948. (647663.)

7910. Marconi's Wireless Telegraph Co., Ltd., Beck, G. E., and Firth, K.—Aerial systems for use on aircraft. 29th October, 1948. (647665.)

9171. Ferranti, Ltd., Jones, W., and Pierson, J.—Noise suppression circuits in radio receivers. 27th April, 1949. (647851.)

9309. Standard Telephones & Cables, Ltd.—Telecommunication exchange. 2nd April, 1948. (647597.)

11011. British Thomson-Houston Co., Ltd.—Refrigerating systems. 21st April. 1948. (647601.)

11253. Combi, A.—Trip mechanism of electrical circuit-breakers. 19th April, 1949. (647855.)

16833. English Electric Co., Ltd., Cross, W. L., Hughes, J. O. P., Wolff, P. H. W., and Frankel, A.—Plate heat-exchangers. 17th June, 1949. (647678.)

17321. Metropolitan-Vickers Electrical Co., Ltd., and Rodda, A.—Light sensitive devices. 22nd June, 1949. (647862.)

18820. British Thomson-Houston Co., Ltd., and Choudhury, S-U.A.—Dynamo-electric machines. 8th July, 1949. (647681.)

23710. Scaife, F. N., and Buckingham, J.—Electric motors and electric motor control systems. 9th September, 1948. (647690.)

23832. Clark, D'A. M. (Koehler Manufacturing Co.).—Electric storage batteries. 10th September, 1948. (647691.)

25135. Creed & Co., Ltd., and Mason, F. P.—Electric motors. 27th September, 1948. (647692.)

25270. Telefonaktiebolaget L. M. Ericsson.—Electromagnetic relays. 28th September, 1948. (647618.)

29727. Standard Telephones & Cables, Ltd., Russell, E. R., and Parkes, E. S.—Joints for coaxial communication cables. 11th November, 1949. (647627.)

29943. Keig-Shevlin, J. T. (Siemens-Schuckertwerke Akt.-Ges.).—Multiple pole automatic electric switches with magnetic and thermal tripping members. 17th November, 1948. (647628.)

30104. Chloride Electrical Storage Co., Ltd., and Coates, A.—Electric batteries. 19th September, 1949. (647630.)

30317. G.W.B. Electric Furnaces, Ltd., and Tatem, J. A.—Electrode type water boilers. 14th November, 1949. (647631.)

30940. Baird, Ltd., J. L., and Anderson, E. G. O.—Very-high-frequency radio receiving apparatus. 28th November, 1949. (647633.)

32237. Liverpool Electric Cable Co., Frost, J. T., and Cox, J. R.—Electric cables. 14th December, 1948. (647753.)

32689. English Electric Co., Ltd., Deriaz, P., and Smith, J. W.—Hydraulic turbines. 25th November, 1949. (647755.)

33581. Crabtree & Co., Ltd., J. A., and Burgess, F. H.—Electric connector blocks and socket contacts therefor. 3rd June, 1949. (647872.)

1949

16161. English Electric Co., Ltd., Gross, W. L., Hughes, J. O. P., Wolff, P. H. W., and Frankel, A.—Plate type heat-exchangers. 17th June, 1949. (647699.)

Amended Specifications

555565. Marconi's Wireless Telegraph Co., Ltd.—Colour television.

578070. Johnson, A. H., and another.—Electric resistances.

582714. Broadway, L. F., and others.—Coupling of hollow electrical resonators.

630147. Standard Telephones & Cables, Ltd., and others.—Cable sheaths and their manufacture.

HELPING THE BLIND

ONE of the outstanding features of the year's work of the National Institute for the Blind is the success of its industrial employment service. The Institute's annual report, which has just been published, records the building up of a network to deal with newly-blinded people and the training of all suitable blind men and women for industry. Industrial training is carried out at a centre established by the Ministry of Labour, with N.I.B. co-operation, at Letchworth. Here people are trained in assembly, inspecting, milling, drilling and capstan lathe operation. Most of the micrometers used for fine measurements have been adapted for braille calibrations, and blind people show particular aptitude with these fine-limit measuring instruments. The year under review has seen 134 industrial workers placed into engineering jobs.

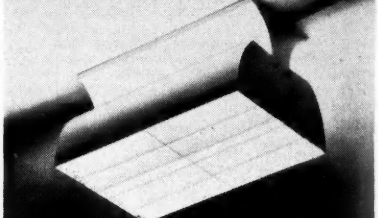
Subscriptions and donations should be sent to the Institute at 224, Great Portland Street, London, W.1.

GYMNASIUM LIGHTING

WHEN undertaking the relighting of the gymnasium at Downs Hall Road School, Ilford, it was suggested to the General Electric Co., Ltd., that a fitting should be designed to harmonize with the architecture of the building, while providing mechanical strength, even illumination and freedom from glare. The new G.E.C. fitting designed for this installation has a substantial body of 18 gauge steel, and is equipped with metal louvres preventing direct view of the two 200 W tungsten lamps with which the unit is fitted. A special arrangement of flat and inclined louvres produces this effect without impairing the wide angle distribution of light.

The reflector is attached by means of two screws at each end to the ceiling-mounted top flare containing the two e.s. lampholders. Two slots running the length of the reflector at the top permit upward light to reach the ceiling. The reflector, and the sides of the top flare, are finished externally with eau-de-nil enamel. Fourteen fittings are used, mounted on the ceiling at a height of 13ft 6in in rows at right angles to the length of the gymnasium. The average illumination is approximately 8 lumens/sq ft. The electrical contractors were B. Winters & Son, Ltd.

New G.E.C. fitting for gymnasium lighting



CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Belfast.—27th November. Ministry of Finance. Electric lamps and electrical supplies at Government establishments for the period ending 31st January, 1952. Forms of tender from the Ministry, Room 103, Law Courts Buildings, May Street.

Blackpool.—1st December. Corporation. Street lighting equipment for Class "A" and "B" roads. (See 17th November issue.)

Bournemouth.—13th December. Corporation. Supply and erection of neon sign at the Pavilion. (See 17th November issue.)

Denbighshire.—21st December. Education Authority. Electrical installations at primary and infants' schools. (See 17th November issue.)

Egypt.—19th December. Electricity and Gas Administration. Supply and laying of underground cables. (See this issue.)

Fife.—27th November. County Council. Electrical work in connection with direct labour workshops at Lebanon, Cupar. R. Galbraith and Lawson, surveyors, 21, Crossgate, Cupar.

Frimley and Camberley.—30th November. U.D.C. Electrical installations in sixty-two prewar houses. Sureyor, Municipal Buildings.

Gillingham (Kent).—12th December. Corporation. Electrical installations in shops, maisonettes and flats. (See this issue.)

Manchester.—15th December. Wythenshawe Estate Committee. Electrical installations in 38 shops, maisonettes and garages, Portway. (See 17th November issue.)

New Zealand.—Wellington.—3rd April. State Hydro-Electric Department. Supply and delivery at Lyttelton of one 5,000 kVA 110/11 kV transformer bank and spare unit for Waitaki power station. (C.R.E. (I.B.) 70084/50. Ten/1850.)* 10th April. 11kV switchgear (contract 172). (C.R.E. (I.B.) 70519/50. Ten/1869.)*

St. Helens.—21st December. Education Committee. Central heating, hot and cold water services and electrical services at proposed Carr Mill Infants' School. (See this issue.)

Southern Rhodesia.—11th December. Electricity Supply Commission, Salisbury. Lightning arrestors, meter protectors and disconnecting switches. (C.R.E. (I.B.) 70285/50. Ten/1863.)*

12th December. Disc insulators and fittings. (C.R.E. (I.B.) 70288/50. Ten/1868.)*

Swinton & Pendlebury.—16th December. Borough Council. Street lighting, Manchester-Bolton road. (See 17th November issue.)

Uruguay.—11th December. Usinas Electricas y Telefonos del Estado. 500 street lighting fittings. (C.R.E. (I.B.) 68992/50. Ten/1829.)* 12th December. Supply of 3,000 metres of rubber covered telephone cable. (C.R.E. (I.B.) 68990/50. Ten/1826.)*

West Bridgford.—4th December. U.D.C. Re-lighting part of Loughborough Road. (See 17th November issue.)

ORDERS PLACED

Burnley.—Corporation Housing Committee. Electrical installations in eight houses on Brunshaw estate (£402).—North Western Electricity Board.

Cockermouth.—U.D.C. Provision of 20 fluorescent lighting units in Main Street (£1,581). —North Western Electricity Board.

Littlehampton.—U.D.C. Electrical installations in 16 houses, Wickbourne estate (£394).—H. F. Lillywhite, Ltd.

London.—L.C.C. Electrical installation at the Honeywell Road School, Battersea.—Honor Bros., Ltd.

Stepney.—Borough Council. Recommended. Electrical installation works in connection with the second portion of the Bancroft Road housing scheme (£9,485).—Messrs. Monks.

Macclesfield.—Corporation. Fluorescent lighting on the main trunk road (£9,471).—North Western Electricity Board.

Manchester.—Electrical installations in 292 houses at Woodhouse Park and Moss Nook neighbourhoods.—H. C. Taylor & Co.

Middlesbrough.—Town Council. Alterations and additions to the electrical installation at the Health Department, Southfield Road (£380).—Electrical Installation Co., Ltd.

Watford.—Corporation. Fluorescent lighting in Section 2 of the High Street (£1,008).—B.T.H. Co.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Annfield Plain (Co. Durham).—Factory (100,000 sq ft) for Ransome & Marles Bearing Co., Newark; North-Eastern Trading Estates, Ltd., Low Fell, Gateshead.

Barking.—Works extensions; Harry Green, Ltd., Ajax Works, Hertford Road.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

Basildon (Berks).—Factory for Basildon Development Corporation; Hosking & Son (Essex), Ltd., Arterial Road, Rayleigh, Essex.

Birkenhead.—Works extensions; Murray Morris & Co., Ltd., 17, Grove Road, Rock Ferry.

Police headquarters (£59,000); Willink and Dod, architects, Cunard Buildings, Liverpool.

Birmingham.—Lecture theatre and library for University authorities (£100,000); V. O. Rees, architect, 51, Queen Caroline Street, London, W.6.

Caistor (Lincs).—Houses (22) for R.D.C.; H. Foster, West Acridge, Barton-on-Humber.

Carlisle.—Additions to City General Hospital and isolation block at Cumberland Infirmary for Newcastle Hospital Board; W. J. Ball, area secretary, 1, Lonsdale Street, Carlisle.

Cheltenham.—Works extensions; Walker, Crossweller & Co., Ltd., Whaddon Works, Clyde Crescent.

Chichester.—Factory and offices (£100,000); C. Shippam, Ltd., East Walls.

Coseley.—Houses (93), Woodcross site, for U.D.C.; Scott and Clarke, architects, Regent Chambers, Wednesbury.

Coventry.—Factory, Torrington Avenue; Veasey & Sharples, Ltd., Clarkes Avenue, Kenilworth.

Fire station, Foleshill Road; Hattrell and Partners, architects, 1, Queen's Road.

Parkgate Lane primary school (£103,750); A. R. Lane, Ltd., Trafalgar Street, Coventry.

Dagenham.—Showrooms and workshops, Whalebone Lane North; Haines & Warwick, Ltd., Vicarage Works, Bradford Road, Ilford.

Dartford.—Works extensions; Apex Construction, Ltd., Bullace Works, Bullace Road.

Dewsbury.—Houses (80), Chickenley estate; borough architect.

Doncaster.—Twelve blocks of "Gregory" flats at Intake estate (£50,160); Walter Dunk & Sons, Ltd., Peel Street, Barnsley.

Ellesmere Port.—Flats, Stanney estate; U.D.C. surveyor.

Eston (Yorks).—Houses (220) for U.D.C.; N. C. Harrison, surveyor.

Guildford.—Pathological laboratory, St. Luke's Hospital; Architect's Department, South West Metropolitan Regional Hospital Board, 76, Wimpole Street, W.1.

Hull.—Reconstruction of Shell House (£59,977); Spooners, Ltd., builders, Glebe Road, Stoneferry.

Hunstanton.—Modern school (£100,000), for Norfolk E.C.; F. Lincoln Ralphs, acting chief education officer, Stracey Road, Norwich.

Huyton - with - Roby (Lancs).—Houses (160), St. John's Road East, for U.D.C.; K. Pilkington, surveyor, Derby Road.

Irthlingborough (Northants).—Houses (20), Addington Road estate for U.D.C.; W. Thompson & Son, Ltd., Finedon Road.

Jarrow-on-Tyne.—Houses (44), South Leam Lane estate; borough engineer.

R.C. school; R. Burke, Lambton House, Lambton Road, Newcastle-on-Tyne.

Leyland.—Houses (60) and 20 flats, Broadfield estate; F. D. Howe, surveyor, Urban Council Offices.

Liverpool.—Bus repair depot at Prince Alfred Road, Wavertree; Rimmer Bros., Ltd., Cheadle Avenue.

London.—Nurses' home, St. Paul's Hospital (£59,000); Regional Hospital Board, 11a, Portland Place, W.1.

BATTERSEA.—Extensions (£270,000), Battersea Polytechnic; Campbell Jones & Sons, architects, 9, Dowgate Hill, E.C.4.

WESTMINSTER.—Multi-storey office block, 2/14, Palmer Street; T. P. H. and E. Braddock, architects, 14, Great Smith Street, S.W.1.

WOOLWICH.—Rebuilding Blue Cross Quarantine Kennels, Shooters Hill Road (£40,000); R. E. Enthoven, architect, 10, Bayley Street, W.C.1.

Mangotsfield.—Houses (56), Hillhouse estate; U.D.C. surveyor, 26 South View, Staple Hill, Bristol.

Matlock.—Junior school, Greenaway Lane, Darley Dale; county architect, Derby.

Milngavie.—Factory; Scottish Industrial Estates, Ltd., 3, Woodside Place, Glasgow.

Morecambe.—Houses (54), Blackberry Hall estate; borough surveyor.

Newcastle - under - Lyme.—Houses for Borough Council:—H. Lainton & Sons, 55, Leech Avenue (13 houses); Phillips Bros. (Silverdale), Ltd., May Street, Silverdale (13 houses); R. Dayson, South Terrace, Wolstanton (15) and Willis Bros., 36 Heath Avenue (8).

Oswestry.—Nurses' home, Orthopædic Hospital, for Regional Hospital Board (£63,000); Tarslag, Ltd., Wolverhampton.

Portsmouth.—Flats (72), Arundel Street; P. Mc. G. Corsar, architect, 67, Commercial Road.

Ross.—Secondary school (£122,250) for Herefordshire E.C.; W. Bowers & Co., Ltd., builders, Bath Street, Hereford.

Rotherham.—Conversion of miners' camp at Harley as temporary housing accommodation for R.D.C. (£10,614); R. Demaine, Main Street, Catcliffe, near Rotherham.

Southampton.—Rebuilding Regent's Park School, Richville Road; R. R. H. Meggeson, town clerk, Civic Centre.

Flats (246), in 14 blocks, Millbrook estate; town clerk.

Stratford-on-Avon.—Adaptation of Ettington Park Camp for R.D.C. (£14,884); Duggins & Co., Cubington Road, Lillington, Leamington Spa.

Sutton Coldfield.—Houses (62), Falcon Lodge estate; Henry Boot & Sons, Ltd., Beeches Road, Birmingham.

Watford.—Houses (58), Leavesden site; borough engineer.

Factory extensions; Sun Printers, Ltd., Sydney Road.

Wigton.—Houses (130); R.D.C. surveyor.

Winchester.—Factory; Curry's, Ltd., 77, Uxbridge Road, London, W.5.

Worcester.—Extensions at Stourport Infants' School (£32,553); Thos. Vale & Sons, Lombard Street, Stourport.